

CA2ONEV 80C26

Cedarvale Ravine

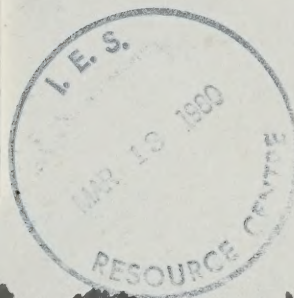
AN ECOLOGICAL AND HUMAN USE STUDY

CA2ONEV 80C26

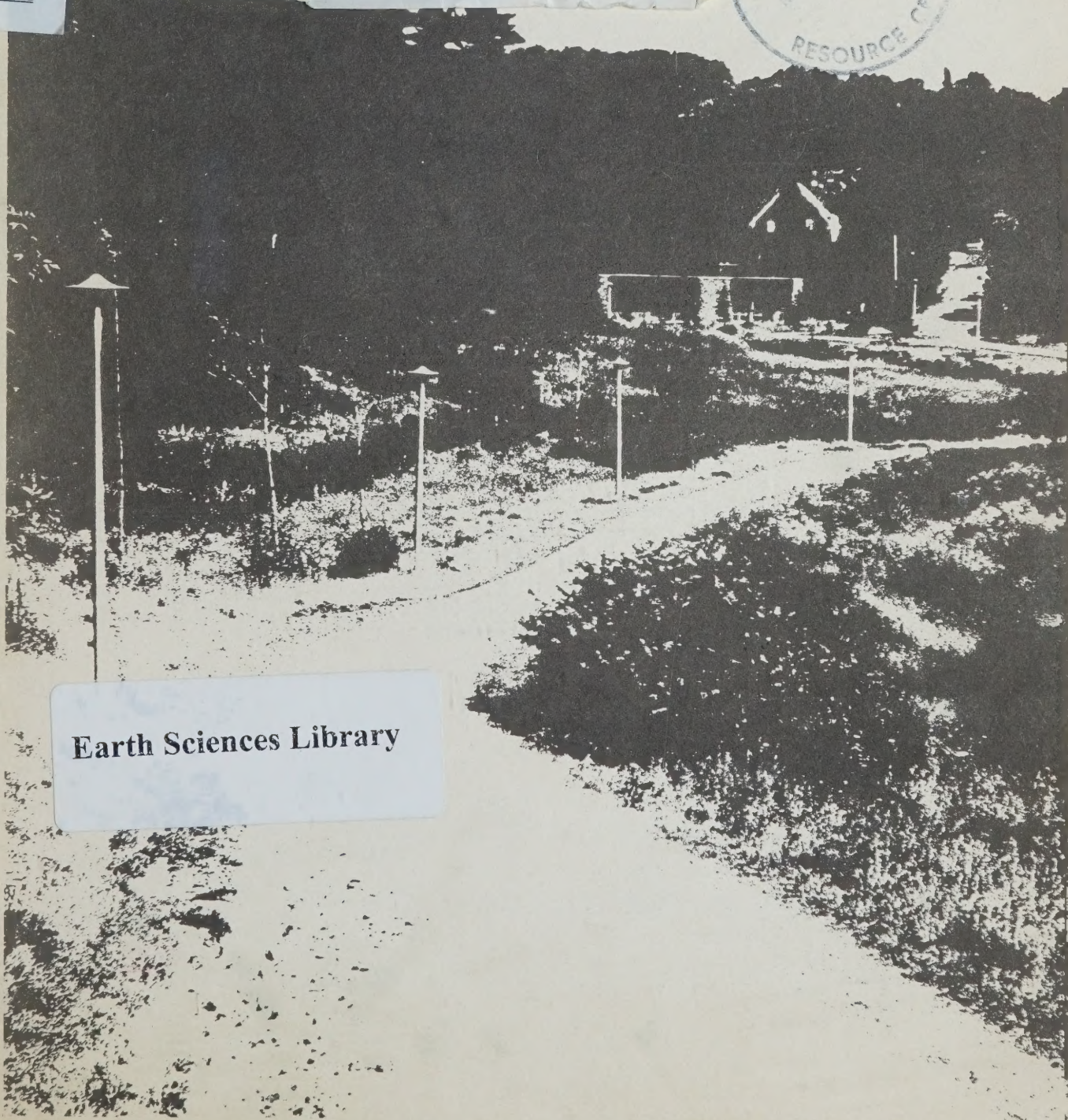
Ontario. WOE.

CEDARVALE RAVINE. AN ECOLOGICAL AND HUMAN USE STUDY. /

Gotfryd, Arnie; Smith, Paul 1980.



Earth Sciences Library



This Copy presented to the
Resource Centre of the Institute for Environmental
Studies

by the authors of the study

March 1980.

CEDARVALE RAVINE

An Ecological
and
Human Use Study

Principal Authors

Arnie Gotfryd and Paul Smith

Staff Contributors

Dr. John L. Cranmer-Byng
supervisor
Patricia McCaw
Alan Greenbaum
Caroline Chodeck
Richard Snell

Funded by an Experience '79 grant from the Ontario Ministry
of the Environment.

Published -- Toronto, February 1980.



Digitized by the Internet Archive
in 2025 with funding from
University of Toronto

<https://archive.org/details/31761056890353>

PERSONNEL

This report is the result of a team effort. Although there was the necessary division of labour, all staff members contributed to all sections of the study.

Paul Smith -- design and coordination of botanical and bird studies; botanical, bird and mammal field work; data analysis of botany, birds and questionnaire; computer work on botanical and questionnaire data; historical research; graphic design and photography; write-up of botany, habitat descriptions, and history; write-up of bird section; write-up of questionnaire section; editing; table and figure preparation.

Arnie Gotfryd -- team co-ordinator; editing; write-up of ravine and neighbourhood birds; write-up of questionnaire results; write-up of Human Use and Management sections; figure and table preparation.

Dr. John L. Cranmer-Byng -- supervisor; wrote Introduction.

Pat McCaw -- lab analysis, data analysis and write-up of soil section; mammal, bird and botany field work.

Alan Greenbaum -- botanical, bird and mammal field work and data analysis; write-up of bird section and habitat descriptions.

Caroline Chodeck -- co-ordinated questionnaire design, drafting, and administration; mammal field work.

Richard Snell -- co-ordination of mammal study; mammal field work, data analysis and write-up.

ACKNOWLEDGEMENTS

This report could not have been as thorough without the enthusiastic support of the following people. We regret any omissions.

Donna Knauber -- mammal field work; questionnaire administration; bird censuses; winter bird study; proof-reading; and numerous other tasks.

Frank Darcel -- Ministry of the Environment, soil analysis.

Bud Knapp -- bird censuses.

Donald Burton and Jack Bateman -- historical information.

David Hanna -- recent bird records.

Herbert Elliot and Hugh Currie -- bird records.

R. W. Osborn -- Dept. of Preventive Medicine and Biostatistics, University of Toronto; questionnaire design.

Emily Hamilton -- Plant identification.

Helen Juhola -- editorial comment.

Harry Kerr -- Christmas Bird Count data.

Neil Melman -- Borough of York Planning -- recent historical and management information.

Cathy Gayle -- Borough of York Parks -- management information.

Don Webb -- TTC -- provided maps, recent historical information.

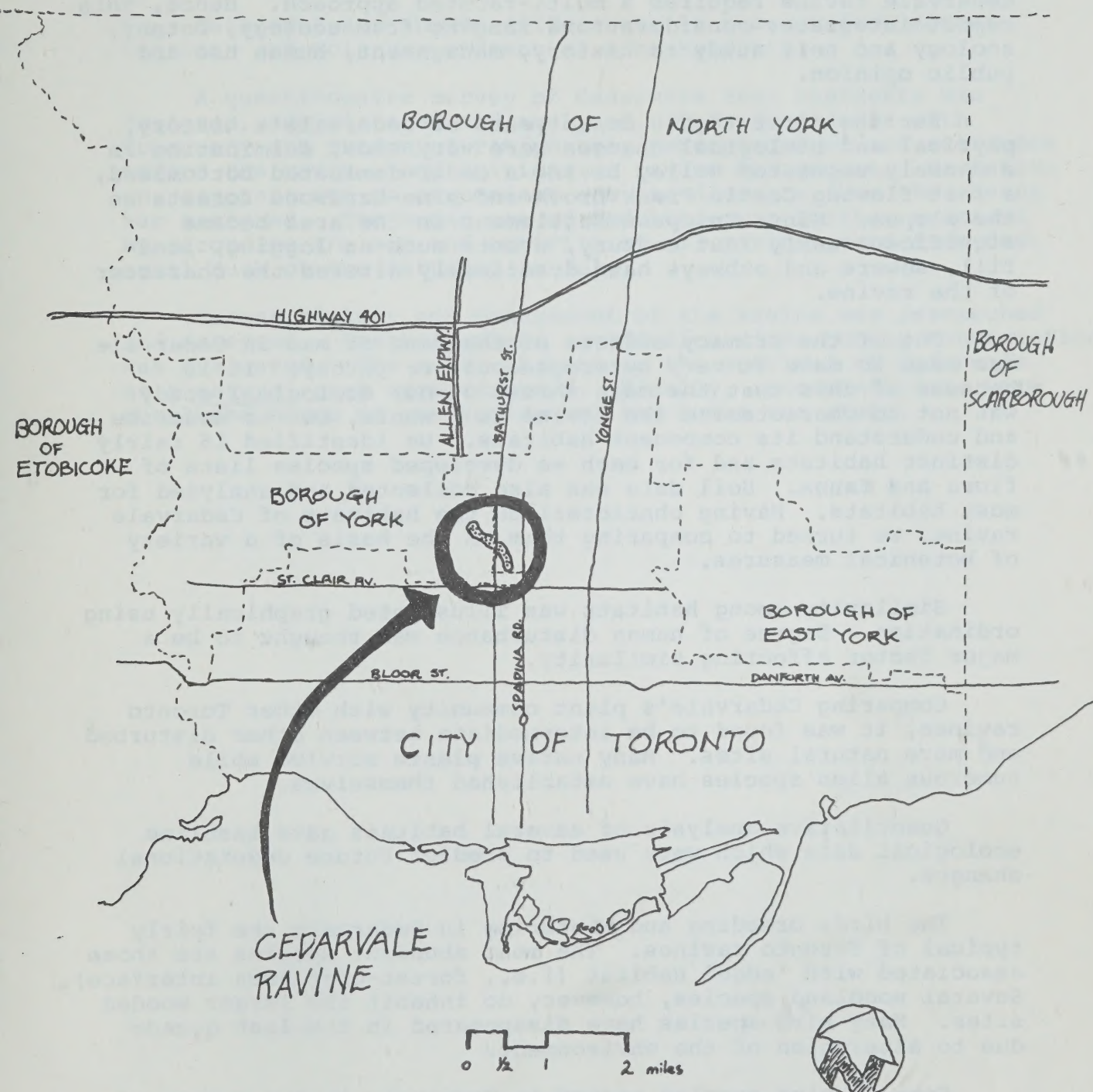
Bill Nydam -- TTC -- provided maps, recent historical information.

John Kimmel -- City of Toronto Parks Commissioner -- management information.

Jerry Pratt -- Metro Properties Dept. -- provided maps; recent historical information.

Carolyn Moulton -- typing.

Figure 1. Map showing the location of Cedarvale ravine within Metropolitan Toronto.



ABSTRACT

Understanding the nature of such a multi-faceted place as Cedarvale ravine requires a multi-faceted approach. Hence, this report integrates considerations ranging from ecology, botany, zoology and soil study to history, management, human use and public opinion.

For the first 10,000 or so years of Cedarvale's history, physical and biological changes were very slow, culminating in a densely vegetated valley having a cedar-dominated bottomland, a fast flowing Castle Frank Brook and pine-hardwood forests on the slopes. Since European settlement in the area became significant early last century, events such as logging, land-fill, sewers and subways have drastically altered the character of the ravine.

One of the primary effects of the hand of man in Cedarvale has been to make it very heterogeneous, or patchy. It is because of this that the main thrust of our ecological study was not to characterize the ravine as a whole, but to describe and understand its component habitats. We identified 16 fairly distinct habitats and for each we developed species lists of flora and fauna. Soil data was also collected and analyzed for most habitats. Having characterized the habitats of Cedarvale ravine, we turned to comparing them on the basis of a variety of botanical measures.

Similarity among habitats was illustrated graphically using ordination. Degree of human disturbance was thought to be a major factor affecting similarity.

Comparing Cedarvale's plant community with other Toronto ravines, it was found to be intermediate between other disturbed and more natural sites. Many native plants survive while numerous alien species have established themselves.

Quantitative analysis of several habitats gave baseline ecological data which were used to predict future vegetational changes.

The birds breeding and wintering in Cedarvale are fairly typical of Toronto ravines. The most abundant species are those associated with 'edge' habitat (i.e., forest-open area interface). Several woodland species, however, do inhabit the larger wooded sites. Many bird species have disappeared in the last decade due to alteration of the environment.

Some 27 bird species nested in Cedarvale in the summer of 1979. Fewer species were observed along the streets bordering the ravine and fewer still were observed 3 to 4 blocks away.

Mammals, reptiles and amphibians have suffered great reductions during the recent history of Cedarvale. There have been many local extinctions, white-footed mice are very scarce, and even gray squirrels only concentrate in a few areas.

Soil analyses showed differences in the nutrient concentrations and moisture content of nine habitats.

A questionnaire survey of Cedarvale area residents was designed, administered and analyzed. Questions dealt with frequency and nature of ravine use, perceptions of and attitudes toward the ravine, and opinions on ravine management. Variation in responses due to respondent age and distance from the ravine was analyzed. The human use of Cedarvale was further assessed by recording the age and activity of all ravine users from dawn until dusk on one Saturday in July.

Recent history and management of the ravine was researched and assessed. The bottomland restoration after subway construction was evaluated. The major threats to the survival of Cedarvale as a natural park were assessed. Finally, recommendations were developed based on our ecological and human use study.

TABLE OF CONTENTS

	Page
Title Page	i
Personnel	ii
Acknowledgements	iii
Abstract	v
Table of Contents	vii
List of Tables	x
List of Figures	xii
List of Plates	xiii
 1 INTRODUCTION	 1
 2 HISTORY	 8
 3 HABITAT DESCRIPTIONS	 13
A East Conifer-Hardwood Site	14
B South-facing Oak Wood	20
C North-facing Oak Wood	26
D Maple Wood	28
E South Disturbed Slope	28
F North Disturbed Slope	30
G Field Border	30
H Bottomland	32
I Field	32
J Fill Site	34
K West Conifer-Hardwood Site	35
L Shrubby Slope	37
M West Swamp	37
N East Swamp	37
O Upland Marsh	38
P Watercourse	
 4 BOTANY	 40
A Introduction	41
B Methods	42
i Qualitative	42
ii Quantitative	42
C Results and Discussion	45
i Comparison of Cedarvale with other ravines	45
ii Habitat comparison through ordination	47
iii Ecological processes	51
iv Age study of oak trees	55
 5 BIRDS	 59
A Introduction	60
B Census Methods	60

	Page
C Results and discussion	61
i Ravine	61
a Breeding census	61
b Comparison with other ravines	64
c Cats, birds and shopping carts	65
d Winter birds	65
e Vale or isle	65
ii Neighbourhood census	67
a Methods	67
b Results and discussion	69
iii Historical bird data	72
6 MAMMALS	74
A Methods	75
B Results	76
i Mice	76
ii Squirrels	76
iii Other mammals	76
C Conclusions	78
7 REPTILES AND AMPHIBIANS	80
8 SOILS	82
A Introduction	83
B Methods	83
i Sampling	83
ii Laboratory	85
a Colour	85
b Texture	85
c Moisture content	85
d Organic content	86
e Nutrient content	86
f Acidity	86
C Results and discussion	87
i Colour	87
ii Texture	87
iii-iv Moisture and organic content	87
v-vi Nutrients and acidity	89
a Preamble	89
b Results and discussion	90
c Conclusions	92
9 QUESTIONNAIRE	93
A Methods	94
B Results and discussion	95
i General	95
ii Neighbourhood comparisons	102
iii Age group comparisons	122
iv Respondents' Comments	127
10 HUMAN USE	130

11	MANAGEMENT	135
	A Changing lands changing hands	135
	B An uncertain future	138
12	RECOMMENDATIONS	146
	REFERENCES	150
	Appendix A- Plant species list	154
	Appendix B- Botany	180
	Appendix C- Birds	187
	Appendix D- Soils	198
	Appendix E- Questionnaire	205
	HABITAT MAP	211

LIST OF TABLES

Table Number		Page
1	Area occupied by each habitat in Cedarvale ravine.	15
2	Physiognomic characteristics of the four main study plots, Cedarvale.	16
3	Quantitative measures of the tree species in the East Conifer-Hardwood Site.	17
4	Quantitative measures of the understory species in the East Conifer-Hardwood Site.	18
5	Relative densities of all reproducing tree species in the tree, sapling and seedling classes.	19
6	Relative composition of shrub cover for the four study plots.	21
7	Quantitative measures of the tree species in the South-facing Oak Wood.	22
8	Quantitative measures of the understory species in the South-facing Oak Wood.	22
9	Quantitative measures of the tree species in the North-facing Oak Wood.	25
10	Quantitative measures of the understory species in the North-facing Oak Wood.	25
11	Quantitative measures of the tree species in the Maple Wood.	27
12	Quantitative measures of the understory species in the Maple Wood.	27
13	Quantitative measures of the tree species on the South Disturbed Slope.	29
14	Relative densities of understory and groundcover species on the South Disturbed Slope.	29
15	Quantitative measures of the tree species on the North Disturbed Slope.	31
16	Relative densities of understory and groundcover species on the North Disturbed Slope.	31

Table
Number

Page

17	Quantitative measures of the tree species in the West Conifer-Hardwood Site.	36
18	Relative densities of the understory and ground-cover species in the West Conifer-Hardwood Site.	36
19	Relative frequencies of plants along the Watercourse.	39
20	Comparison of Cedarvale with three other ravines with respect to the plant species present.	46
21	Number of plant species present in four Toronto ravines.	46
22	Correlations among four physiognomic characteristics measured in all plots.	52
23	Correlations among choke cherry density, other plant density and canopy cover.	53
24	Age-diameter correlations for red oaks from two stands.	56
25	The breeding bird census of Cedarvale.	63
26	Winter bird densities in Cedarvale ravine.	66
27	Numbers of bird species observed in the four neighbourhood census areas.	70
28	Densities of all birds and urban birds in the neighbourhoods.	70
29	Bird species observed in Cedarvale ravine and surrounding neighbourhoods during breeding census.	71
30	Mammals of Cedarvale: past and present.	79
31	Sample questionnaire.	96
32	Questionnaire responses by neighbourhood.	106
33	Questionnaire responses by age.	123
34	Activity and age of ravine users.	131

LIST OF FIGURES

Figure Number		Page
1	Map showing location of Cedarvale Ravine within Metropolitan Toronto.	iv
2	Ordination of the woodland canopy communities of Cedarvale.	48
3	Ordination of the woodland understory communities of Cedarvale.	49
4	The relationship between age and diameter among red oaks in Cedarvale.	57
5	Breeding bird census map.	62
6	Location of bird census areas in the neighbourhood surrounding Cedarvale ravine.	68
7	Small mammal trapping data.	77
8	Habitats sampled for soil.	84
9	The relationship between moisture content and organic content in Cedarvale's soil.	88
10	Hourly ravine use for July 28, 1979, expressed as per cent of total number of users for the day.	133
11	Ownership and status of lands in Cedarvale, Forest Hill and Nordheimer ravines.	137
12	Proposed residential development on former St. Michael's College lands in the Cedarvale ravine.	139
13	Proposed area of official protection for Cedarvale ravine (portion within the Borough of York).	144
14	Proposed area of official protection for Cedarvale ravine (portion within the City of Toronto).	145
15	HABITAT MAP	211

LIST OF PLATES

Plate Number		Page
1	The Forest Hill spur ravine in July, 1979.	4
2	The view northwest from Bathurst Street toward Glen Cedar Road.	4
3	Cedarvale ravine in 1946.	11
4	Castle Frank Brook as it looked in 1946.	11
5	A large cattail marsh which existed just southeast of the old Bathurst Street bridge.	11
6	The Field Border habitat as it appeared in July, 1979.	24
7	The East Conifer-Hardwood habitat as it appeared in January, 1980.	24
8	The Field habitat as it appeared two weeks after mowing in July, 1979.	33
9	The North-Facing Oak Wood as seen in January, 1980.	33
10	The slope behind 15 Strathearn Road in January, 1980.	141

INTRODUCTION

1. INTRODUCTION

by Jack Cranmer-Byng

"From thicket to thicket I pushed on up to the field below the Bathurst viaduct, then back on the western slope to the dump above St. Clair. How many flowers were still in bloom. The last aster; here and there a yellow head of goldenrod; dandelions, blue chicory, tansy, pink and white clover, yellow and white melilot, sunflowers, butter and eggs, sow-thistles and viper's bugloss. And in the midst of all these were birds. My last bird sight of this noble walk was a noble white-crowned sparrow just below my feet over the edge of the dump. In an hour and a half, I had seen twenty-eight kinds of birds, including 200 robins, 150 myrtle warblers, a gray-cheeked thrush and a towhee."

Richard M. Saunders
Flashing Wings, 1947

(This entry in his journal was written in early October, 1942.)

If you have never visited Cedarvale Ravine before, or haven't walked in it for a long time, why not have a look at it now that the construction of the Spadina subway line under the floor of the ravine has been completed, and the new Bathurst Street bridge is finished, and replanting of the bottomland has ended. But don't expect the wealth of vegetation and wildlife that Richard Saunders described in the 1940s in his journal when he used to walk up the Nordheimer-Cedarvale ravine from his home near Boulton Drive. Much has changed for the worse since then; yet the geological structure of the ravine is still there, a small watercourse runs above the ground for half the ravine's length, and there are still trees and shrubs on its slopes. So, enjoy the attractions which the ravine still offers.

Local residents can enter the ravine from at least six different points, but those coming from further afield may find the approach from St. Clair the most convenient. Leave the subway at the Heath St. exit and looking northwards, you will see a path snaking its way down an incline and along the floor of the ravine. As you start walking you may notice some saplings which were planted there in 1978, tall but spindly. This is where the ravine begins, and these young trees are your first encounter with the natural environment, or more accurately, the semi-natural world. At least it is open to the sky. But this won't last much longer because Cadillac-Fairview Corporation has begun construction of a high-rise apartment adjacent to the pathway, which will overshadow anyone walking there. The building will cut off the early morning sunlight, lessen the amount of light at all times, and block out the view immediately to the

east. The significance of this dominating structure beside the pathway as you enter the ravine is more than simply physical; it is psychological as well. Walk quickly past it, come out into full light again, and move down the pathway. This, at least, is not made of asphalt, but of white-coloured crushed stone; quite pleasant to walk on. Straight ahead is Glenayr Road which comes to a dead end at this first bend in the ravine, at a point where the Toronto Transit Commission's emergency services building stands, a low brick structure partly screened by recently planted evergreens. To your left (the west side of the ravine) are some prominent white birch trees on the lower slopes of the ravine, along the centre is the beginning of a marshy ditch where cattails and yellow iris grow, while immediately to your right (the east side) is a gentle rise in the ground covered with quite thick underbrush and dominated by tall white pines and hemlocks.

(Cardinal Corner and Pine Tree Knoll are the names used by Richard Saunders in his journal to identify this bend in the ravine.) From here a miniature ravine runs eastward to Relmar Gardens in Forest Hill Village. It is a pleasant place in which to ramble, or just sit and look, and listen. In winter it is protected from the wind, but the sunlight can penetrate through the trees, while in the height of summer, it is shaded and cool. This is the spot where you are likely to first hear the song of cardinals as you walk from Heath Street. I've heard them as early as January, on a mild sunny day, calling to each other across the ravine, and in spring and early summer loudly and continuously. They nest somewhere in the thickest part of this area. Standing still amid this tangle of vegetation it is possible to feel remote from the tensions of the human world for awhile. The sounds of traffic on Spadina and Bathurst are muffled, and movements of people are screened from view; mourning doves feeding on the ground, or calling from the branches above, make the only movement or sound. But it isn't likely to be a haven of quietness much longer if Cadillac-Fairview wins its hearing before the Ontario Municipal Board, and are allowed to construct low-rise apartments and townhouses. Such a mass of buildings, and such a concentration of people on the field which stands above this small ravine will remove forever its atmosphere of apartness and peace.

Leaving this side-ravine, you regain the path and resume your walk. Once past the T.T.C.'s service building, you may become conscious of the horizons beyond, because the valley is wide and open here. Bathurst bridge, with a wide sweep of sky above it, forms one horizon, while at a higher level another horizon is formed by the sky and the tops of the tall trees of the woodland which caps the high ground away to your right. Along the middle of the valley floor runs the narrow line of a marshy ditch, full of cattails, bright green in summer, but in winter, a contrast of pale brown of dead leaves with the dark brown pokers full of the cattail seed. Take one in late winter and release its tightly packed featherweight seeds and watch them slowly float away like silver snowflakes. Now look upwards to your right (north-eastwards) to the patch of vegetable gardens in an area of prolific growth of wild plants, and above them to where two small upland meadows



Plate 1. The Forest Hill Spur Ravine in July, 1979.



Plate 2. The View North from Bathurst St. toward Glen Cedar Rd.

are terraced one above the other, but divided by a steep bank covered with an exuberant tangle of shrubs and vines, in sharp contrast to the meadows above and below which are regularly mown each summer. Standing at one end of the tangled bank is a single large elm, a fine landmark, good for the birds to perch on as a vantage point. In the fall of 1973, the last year before subway construction began, I sat in the autumn sunlight and watched two hawks, kestrels, chasing each other in play around the elm tree, while a family of five flickers was feeding busily on a dead tree nearby, and a family of rose-breasted grosbeaks moved through the undergrowth of the bank. Below me, in the unmown field lay a tapestry of wild asters, mauve and purple, interspersed with goldenrod and the bright colours of many butterflies which I viewed through binoculars. There is a wide view from here, and it is a good place to sit awhile and daydream.

Between the path, the vegetable patch and the Bathurst bridge, the water seeps down the hillside, creating a very boggy area. Several weeping willows grow here, graceful in their summer foliage, but loveliest in the early months of the year when their trailing, ochre-yellow branches make a lacy effect against the darker colours of the other trees; very attractive to the eye. At this point the view up the ravine is blocked by the new Bathurst bridge. It is harsh on the sight, though in summer its outlines are softened a little by a surrounding frame of greenery. Just before you reach the bridge there is an extensive thicket of shrubs and vines on your right, on the level ground before the hillside begins. If you penetrate this dense tangle in summer you will be screened from the path, in a private world of your own, a world of thick greenery and the continual movement of insects and small birds. On a sunny winter's day, you can still find a few moments of seclusion here, though spoilt a little by the sound of traffic crossing Bathurst bridge. As you pass under the bridge you will see a small watercourse, all that is now left of the once larger and faster flowing Castle Frank Brook (now piped ignominiously into a trunk sewer).

At this point the path curves again, and ahead there is a view of the ravine as it begins to narrow, and on the horizon one's eyes are drawn to a single span of an old bridge, the Glencedar footbridge, crossing the ravine on a single concrete pier with iron railings above, dilapidated, but looking a little more in harmony with its natural surroundings. The bridge shuts out the landscape beyond, leaving one with a feeling of curiosity, wondering what unfolds beyond the crumbling bridge and the trees on the ravine slopes which flank it. Now bring your eyes back to the scenery close at hand on your right where there is a swampy area with cattails, arrow leaf and watercress growing that extends most of the way on the northeast side to Glencedar bridge. At one point in this little marsh, just beyond the chain-link fence which marks the property line, are several tall, dead cottonwoods of a rather distinctive silvery-gray colour (the bark has long ago fallen off). Look up the trunk of one of them to the sky above. As the clouds move across the top of your tree you are likely to feel that you are moving with them. It is a curious sensation caused by your eyes being given a fixed point of

reference by the spire of the dead tree in relation to the moving clouds above it. It feels as though you yourself are plugged into the movement of the clouds. These tree trunks are like monumental sculptures -- in marble -- pitted by time and woodpeckers. Now, something moves in the living oak trees on the ravine slope just beyond; a pair of nuthatches are creeping down the trunks of two trees, head first, searching for grubs. All along this part of the ravine the ground is very wet and heavily vegetated, most of it in private ownership; it is a good place for birds because they find ample food and cover here. Even in mid-winter, you may see a robin or two surviving here, while in the early spring the first northward migrating warblers tend to linger here, feeding on the first insects of the year in the warming sunlight. In winter you may be able to glimpse the water of the shallow watercourse running fast beneath the ice, an assurance that not everything is frozen stiff.

After Glencedar bridge, still on your right, is a good stand of red oaks, sturdy trees, grown to endure. The swamp here has water all the year, with a covering of duck weed, and a good stand of cattail rushes, where redwing blackbirds display and chatter in the spring. A pair of thrashers sang loudly from the oaks on the hillside above all last spring and on into the summer. On the opposite side of the ravine is another swampy cattail marsh, containing trees and shrubs; willows, alder, dogwood and many other species, a likely place to see swamp sparrows, or a flock of cedar waxwings. Now you begin to emerge from the ravine on the wide and open bowl of Cedarvale Park, with the dome of a hockey arena looming on your horizon to the west, while on your immediate right is a grassy knoll crowned by an oak tree. At this point you leave the world of natural vegetation maintained by natural processes and enter a barren-looking area dominated and drilled by human forces. The grass here is continually mown, nearly down to its roots; consequently it lacks the capacity to hold moisture and its roots have no protection from the sun so that it is a brownish colour most of the year. If we walk up to the top of the knoll and look northwards we see the path winding away over the horizon towards the roofs of houses in the direction of Eglinton Avenue. At your leisure admire the wide expanse of sky on all sides of you, and look back at the way we have come.

So, we have had an enjoyable walk through the length of Cedarvale Ravine. As a natural area it is far from perfect; there is too much garbage in it, and too many signs of damage by human beings, and the replanting has fallen short of success. Nevertheless, it is a living landscape, it does what no human-built structure can ever do -- it grows, it changes with the seasons, it reproduces seeds, and roots, and eggs and young. When we, as human beings, stroll in the ravine and respond to its natural rhythms, we become for a brief while, an integral part of this natural network of life.

Recently three of us were walking in the ravine when we met a woman who lives close by. She told us that she walks in Cedarvale ravine most days of the year, and added, "It has saved my sanity." What better argument could anyone put forward for preserving any urban natural area, than that it helps to preserve the sanity of the citizens who use it. Now close your eyes and imagine a four-lane highway, a second Don Valley Parkway, transposed into Cedarvale Ravine, with cars, trucks, and coaches roaring along in both directions, the shoulders of the highway almost up to where the ravine slopes begin. Imagine the roar, the violent movements, and the stink of gas and oil. Or imagine a few more housing projects rudely dominating various sections of the ravine. Or imagine several wide swaths bulldozed clean of trees on the privately owned slopes. What will there be left for you to enjoy in Cedarvale Ravine then? WHERE WILL YOU FIND A PLACE OF PEACE AND QUIET TO HELP RESOLVE YOUR TENSIONS THEN?

January 1980





HISTORY



2. HISTORY

Fifteen thousand years ago the last glaciers (of the Wisconsin glaciation) retreated northward and left a wide plain of glacial till in the Toronto region, including the Cedarvale area (Allen, 1970). The meltwater from these glaciers formed Lake Iroquois, a larger version of present-day Lake Ontario. The north shore of this lake was at present-day Davenport Road. The lake eroded the glacial till and deposited sand, creating the plain on which downtown Toronto is built. This plain, the Iroquois Plain, was, at the time of European contact, dominated by oak and pine forest with little understory (Anonymous, 1950). North of the old lakeshore, the till remained with forests composed primarily of sugar maple and beech (Faull, 1913). The valley bottom forests were composed of white cedar, tamarack and white and yellow birch. In addition, Toronto was a region where southern flora and northern flora met. The western end was more Carolinian (southern) while the east tended to be more Boreal (northern) in character. The abundance of red oak suggests a more Carolinian character for Cedarvale than other ravines in the Don watershed.

The present Don River watershed was formed during the retreat of Lake Iroquois to the present level of Lake Ontario. Castle Frank Brook was part of this system with two branches which joined in the Cedarvale ravine at the foot of Glenayr Road. The larger branch originated in the Dufferin-Lawrence area and flowed south through Cedarvale. The smaller branch had its source in the vicinity of Bathurst and Eglinton and entered Cedarvale through the Forest Hill spur ravine just north of Lonsdale. From the fork, Castle Frank Brook flowed through Nordheimer Ravine and Rosedale Valley to the Don River (Faull, 1913).

The indigenous inhabitants of this region, the Mississauga Indians, apparently did not settle in the Toronto area (Anonymous, 1950). They did, however, use the Don Valley as a transportation route and came to a large clearing east of Cedarvale to hunt deer, which were plentiful in that area. The trail they used later became Old Forest Hill Road (French, 1964).

With the arrival of the Europeans and the founding of York in the 1700s, human impact on the landscape began in earnest.

At this time, wildlife was abundant. Wolves and bears were reported as late as 1821 in the Don Valley (Anonymous, 1950). Mrs. John Graves Simcoe living at Castle Frank reported bald eagles in the area. Passenger pigeons, once so plentiful, were last seen in the Toronto region in Cedarvale ravine in 1896 (Anonymous, 1950).

Lumbering was the first industry to affect the Cedarvale environs. White pine was sought after for masting, because of its great height and straight trunk. After pines, the oaks were most desired for fuel and lumber.

Most of the forest was removed from the Toronto area in the mid

to late 1800s. Between 1840 and 1900 the amount of woodland decreased from 40% to 5% (Anonymous, 1950). As a result, today 80% of the forest in the Don watershed, including Cedarvale, is classified as second growth (i.e. trees mostly less than 100 years old). This is substantiated by our own studies of tree age (see Botany section).

The first report of agriculture in the area is Lawrence Baldwin's estate, built in the 1830s. It was located just to the east of Cedarvale near the Indian trail mentioned above.

Many sawmills and grist mills sprang up along the Don to service the lumber trade and expanding agriculture. In 1800, a grist mill was built on Castle Frank Brook at Poplar Plains Road (Anonymous, 1950). The mill was active until it was burned down during the 1837 rebellion.

Transportation demanded more and more attention as the town grew, and in 1850 Vaughan Road was built. It extended from Davenport Road to what is now Dufferin Street and then north to Kleinburg. It was, as many roads then, a toll road built of wooden planks. Eglinton Avenue, or Base Line as it was known, was a mud trail until 1889 when it was extended to Weston Road (French, 1964).

By 1909 the community of "Spadina Heights", centred at Lonsdale and Spadina, had a population of 500 (French, 1964). The area was still largely agricultural. The local residents enjoyed the ravines then as they do today. One inhabitant described their use:

The paths bordering these streams were a great spot for Sunday afternoon walks, particularly for boys and their girlfriends. On an early spring morning there were all kinds of birds - Robins, Blue Jays, Cardinals and a great deal of wildlife...

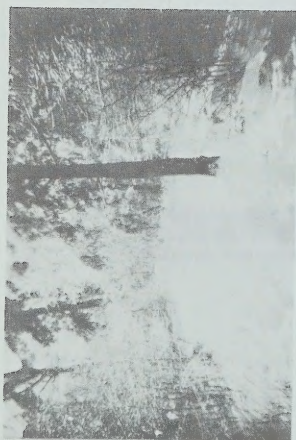
I remember the frog band so well, there were any number of them and not all of them on the same note. (French, 1964)

At this time most of Cedarvale was owned by a farmer named Brown, the northern end of Nordheimer Ravine by Austin and the southern portion by Sam Nordheimer.

In 1923 Forest Hill was incorporated as a village. By this time the Glen Cedar, Bathurst, St. Clair and Spadina bridges had all been constructed to cross the Cedarvale and Nordheimer ravines.

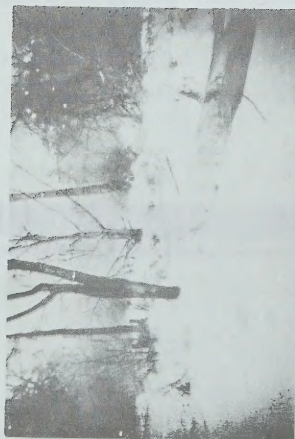
During the following 30 years the ravines were intensively visited by local naturalists and the flora and fauna documented. James Ballie frequently mentioned Cedarvale in his nature columns for the defunct Toronto Telegram.

In this period the ravine was gradually 'parkified' as R.M. Saunders (1947) put it. Underbrush was removed and grass planted.



D. Burton

Plate 3. Cedarvale Ravine
in 1946.



D. Burton

Plate 4. Castle Frank Brook as
it looked in 1946.



D. Burton

Plate 5. A large cattail marsh which
existed just south of the
old Bathurst St. bridge.

During the construction of the Yonge Street subway in 1951 large amounts of excavated clay were dumped on the field at the foot of Lonsdale (at that time an orchard). Consequently, the vegetation was completely destroyed (Don Burton, personal communication). Shortly after this event, in 1952, the area just north of St. Clair Avenue was filled in and the connection between Cedarvale and Nordheimer Ravines ended. A dump had existed on the east side and the above action was simply an extension of this policy. This allowed the construction of the Loblaws parking lot and the extension of Heath Street westward.

The next ten years brought the demise of several major natural areas in Cedarvale. A large cattail marsh located just south of Bathurst Street, a cedar wood between Bathurst and Cedarvale Park, large marshy areas in Cedarvale Park as well as open fields south of Ava Road were all altered during this time. While the construction of Cedarvale Park and its arena was badly needed in the densely populated area, the other changes were of dubious benefit.

With the anticipated extension of the Allen Expressway south, storm sewers were installed in Cedarvale during 1968-1970 (David Hanna, personal communication).

In 1974 construction of the Cedarvale portion of the Spadina subway began. The construction was completed in 1977 and work began on replanting vegetation on the ravine floor and the formation of a new stream channel for Castle Frank Brook (recent history is detailed further in Section 11.A.).

Throughout Cedarvale's history, people have enjoyed its natural environment. Cedarvale has been spared total development and been somewhat restored, precisely because many people feel the need for such natural areas within the urban situation. We have seen how the natural habitats and ravine borders have been altered and eroded in a gradual process. Natural urban areas seldom disappear through a single act of one agency, but rather, through the unspoken acquiescence among residents, government and industry over a long period of time.



Habitat

Descriptions



3. HABITAT DESCRIPTIONS

Cedarvale ravine is a diverse collection of biotic communities, some of great age and others of very recent origin. We felt the most accurate and understandable method to characterize Cedarvale was to briefly describe each of these biological habitats.

The descriptions result from both our scientific investigations and our personal impressions and observations gleaned from the summer's field work.

Each habitat is discussed in succession. The total area occupied by each is given in Table 1. Its biological and physical make-up and its use by humans is outlined. Ecological changes, past and future, in each, are determined.

Photographs, tables and a map showing each habitat's location (Fig. 15) are aids to the reader's interpretation.

Please fold out this map on the last page of this report while you are reading the descriptions. The reader is also asked to read pages 42 through 44 of the Botany section. This will aid the comprehension of several botanical measures used in the descriptions.

A. EAST CONIFER-HARDWOOD SITE

In the 1930s and 40s local naturalists referred to this spot as the "Pine Knoll", as conifers are more prevalent here (and across the valley) than elsewhere in the ravine. Many of the large white pines have fallen, as evidenced by the numerous stumps and fallen logs present. Most native conifers and especially white pine are known to suffer from air pollution. This mortality (whatever its causation) probably led to the observed low amount of canopy cover and the great variation of this parameter within the site (see Table 2). The result was the invasion of pioneer and shade intolerant species such as black cherry and staghorn sumac, which are yet quite young (see Appendix Table B4).

Hawthorn, however, is by far the most important species and has been so since at least the 1920s (Don Burton, personal communication). As a result one would expect the average age of hawthorns to exceed 60 years, but the mean age is only 30.1 years. This suggests a fairly short life span for hawthorn trees.

The short stature of the above species accounts for this site having the lowest mean canopy height of the four main study sites (see Table 2).

Table 1. Area Occupied by Each Habitat in Cedarvale Ravine¹(absolute area and % of the total area)

HABITAT	Area (ha) ²	% of Total Area
Open Bottomland ³	6.9	33.0
Field	1.5	7.2
Fill Site	0.8	3.8
Other Open Areas	0.4	2.0
Maple Wood	0.4	2.0
West Conifer-Hardwood	0.7	3.3
East Conifer-Hardwood	0.7	3.3
South-facing Oak Wood	0.7	3.3
North-facing Oak Wood	2.0	9.6
North Disturbed Slope	0.7	1.5
South Disturbed Slope	0.7	3.3
Field Border	1.3	6.2
Upland Marsh	0.5	2.4
Other Wooded Areas	4.0	19.1
Total Open Areas	9.6	46.0
Total Wooded Areas	11.3	54.0
ENTIRE RAVINE	20.9	100.0

¹ Area from the limit of wooded area at northwest end to Heath street in the south. Measured from aerial photograph using a planimeter.

² One hectare = 2.47 acres. Total area is 53 acres.

³ Includes the watercourse and the west swamp.

Table 2. Physiognomic Characteristics of the Four Main Study Plots, Cedarvale.¹

CHARACTERISTIC	West Mixed Conifer-Hardwood	Maple Wood	North-facing Oak Wood	South-facing Oak Wood
Canopy Cover (%)	68.9 ± 27.8	71.3 ± 20.4	77.7 ± 20.5	78.3 ± 16.0
Canopy Height (m)	18.3	23.6	24.4	22.8
Litter Cover (%)	67.5 ± 25.1	57.9 ± 21.9	74.7 ± 23.9	75.1 ± 22.7
Shrub Cover (m ² /m ²)	747 ± 1.36	998 ± 1.99	1.52 ± 3.99	4.39 ± 9.06
Height of Shrubs (cm)	117 ± 62.6	180 ± 157	152 ± 110	161 ± 128
Plant Density (/m ²)	33.5 ± 24.9	13.4 ± 11.0	7.50 ± 6.14	18.3 ± 17.1
Tree Density (/ha)	400.0	366.7	483.3	603.0
Basal Area (m ² /ha)	28.34	33.05	47.91	185.7

¹ Figures are given as means ± standard deviation (where applicable).

Table 3. Quantitative Measures of the Tree Species in the East Conifer-Hardwood Site

SPECIES	Importance Value	Relative Density	Relative Dominance	Relative Frequency
Hawthorn	86.3	37.5	18.0	30.8
Black Cherry	58.9	18.7	17.1	23.1
White Pine	54.0	10.4	33.4	10.2
Hemlock	40.5	10.4	19.9	10.2
Staghorn Sumac	22.5	10.4	1.9	10.2
White Birch	14.6	4.2	5.3	5.1
Yellow Birch	7.7	2.1	3.0	2.6
Norway Maple	5.5	2.1	0.8	2.6
Sugar Maple	5.1	2.1	0.4	2.6
Buckthorn	4.9	2.1	0.2	2.6

Table 4 . Quantitative Measures of the Understory Species in the East Conifer-Hardwood Site

SPECIES ¹	Prominence Value	Density (/m ²)	Frequency (%)
Garlic Mustard	83.66	10.80	60.0
Choke Cherry	51.71	6.18	70.0
Goldenrod spp.	14.02	2.43	33.3
Poison Ivy	6.20	1.70	13.3
Raspberry spp.	5.89	1.22	23.3
Hawthorn	5.28	1.18	20.0
White and Yellow Avens	4.00	0.98	16.7
Dame 's Rocket	3.69	1.28	8.3
Highbush Cranberry	3.21	0.75	18.3
Black Cherry	2.91	0.92	10.0
Norway Maple	2.84	0.48	35.0
Herb Robert	2.10	0.73	8.3
Sunflower spp.	1.93	0.67	8.3
Common Blackberry	1.55	0.40	15.0
Violet spp.	1.26	0.40	10.0
Aster spp.	1.16	0.45	6.7

¹ All other species have P.V.s less than 1.0.

Table 5. Relative Densities¹ of All Reproducing Tree Species in the Tree, Sapling and Seedling Classes.

SPECIES	Maple Wood			South-facing Oak Wood			North-facing Oak Wood			East Conifer-Hardwood Site		
	Tree	Sap-ling	Seed-ling	Tree	Sap-ling	Seed-ling	Tree	Sap-ling	Seed-ling	Tree	Sap-ling	Seed-ling
Sugar Maple	-	-	-	12.0	0.7	6.0	13.8	-	43.8	2.7	-	-
Norway Maple	31.8	75.0	81.7	-	2.7	-	10.2	14.3	37.2	2.7	-	17.1
Red Maple	-	-	-	2.0	13.2	-	8.7	23.6	6.2	-	-	-
Manitoba Maple	-	-	3.7	-	-	14.0	-	-	-	-	-	-
Beech	-	-	-	3.0	-	2.0	6.0	42.8	18.7	-	-	-
Ironwood	-	-	-	3.0	18.2	-	-	-	-	-	-	-
Black Cherry	-	-	6.7	-	-	-	2.5	-	-	18.7	20.0	32.3
Black Walnut	-	-	-	-	-	-	-	-	-	-	20.0	-
Staghorn Sumac	-	-	-	-	-	-	-	-	-	10.4	40.0	8.8
White Ash	-	25.0	8.5	11.0	15.4	78.0	1.7	14.3	-	-	-	-
Hawthorn	-	-	-	-	-	-	-	-	-	37.5	20.0	41.8

¹ Relative density of a species is it's density divided by the density of all species combined.

In addition, this site has the lowest amount of leaf litter cover and shrub cover, as well as the shortest mean height of shrubs. The former condition is probably due to the high degree of human use of this habitat. The latter two facts are probably due to the importance of shrubs like raspberries and blackberries in this site (see Table 3). These species are low and occupy comparatively little area per plant.

Overall understory plant density is the highest of all study sites and differs significantly from the others (t-test, $p < .05$). Herbaceous species are especially common and are generally shade intolerant species. Thicket and mat forming woody species such as poison ivy and raspberries also contribute to the high plant density.

Paths crisscross these woods and indicate the popularity of this site for strolls.

The tree species important in both the sapling and the seedling classes are black cherry, sumac and hawthorn (see Table 5). Hence, we can expect these species to increase in prevalence. Sugar maple also has seedlings and saplings which are clustered around a huge sugar maple just east of our sample area. This is probably the largest tree in the ravine, and possibly the oldest.

Four species of birds raised broods of young on the "Pine Knoll". Such species as blue jay, cardinal and catbird pairs were observed feeding their young and singing from perches in the area. A northern (baltimore) oriole pair also frequented this site but nested nearby.

In the past (1930s-1950s) this area has supported owls of several species in both the winter and summer (see Appendix Table C.1.). Apparently they have deserted the area as no recent sightings have been reported. The site supports the densest population of black and grey squirrels in the ravine. The estimated population of squirrels is 38 (see Mammal Section).

These woods are still privately owned, the bulk by Cadillac-Fairview Corporation.

B. SOUTH-FACING OAK WOOD

The Oak Woods just east of Bathurst Street is still relatively undisturbed although much of it occurs in private yards. This tract is unique in a number of ways. It exhibits a denser growth of all strata. The tree density is the highest of all sampled habitats and the total basal area differs from the other plots by an order of magnitude (see Table 2). Understory plant density is second highest of the plots even though

Table 6 . Relative Composition of Shrub Cover by Species for the Four Study Sites.¹

SPECIES	Maple Wood	South-facing Oak Wood	North-facing Oak Wood	East Conifer- Hardwood Site
Norway Maple	60.7	2.3	10.0	14.6
Choke Cherry	10.7	9.7	49.2	19.6
White Ash	3.6	14.2	2.8	-
Tartarian Honeysuckle	10.5	0.1	-	17.1
Red Maple	-	4.5	11.1	-
Witch Hazel	-	49.0	-	-
Highbush Cranberry	6.9	0.0	-	1.2
Black Cherry	1.7	-	-	11.5
Beech	-	0.0	12.8	-
Ironwood	-	18.1	-	-
Hawthorn	-	-	-	15.5
Sugar Maple	-	1.5	5.7	-
Other Species	5.9	0.6	8.4	20.5

¹ Values are percentages of total shrub cover.

Table 7 . Quantitative Measures of the Tree Species in the South-facing Oak Wood.

SPECIES	Importance Value	Relative Density	Relative Dominance	Relative Frequency
Red Oak	198.0	64.6	32.9	50.5
Sugar Maple	35.8	12.3	5.5	18.0
White Ash	31.6	10.8	7.9	13.0
White Oak	11.6	4.6	2.0	5.0
Beech	8.9	3.1	0.8	5.0
Ironwood	8.6	3.1	0.5	5.0
Red Maple	5.5	1.5	0.5	3.5

Table 8 . Quantitative Measures of the Understory Species in the South-facing Oak Wood.

SPECIES	Prominence Value	Density (/m ²)	Frequency (%)
Choke Cherry	41.99	5.32	62.2
Zig Zag Goldenrod	35.32	6.64	28.2
Lily-of-the-Valley	10.72	3.10	11.2
White Ash	4.20	0.72	34.0
Blue-stemmed Goldenrod	2.94	0.96	9.4
Witch Hazel	2.35	0.57	17.0
Highbush Cranberry	1.75	0.74	5.6
Red Currant	1.75	0.64	7.5

the canopy is most complete, and the amount of shrub cover is greatest.

The most important factor in the causation of the high density is the level of solar radiation. The south-facing aspect of the slope and the angle of the sun's rays allow a considerable input of solar energy.

There are a great number of oaks here with multiple trunks which may be a result of very favourable conditions for growth.

Here again, there is a total lack of reproduction in oak, even with the elevated light levels. The dense shrub layer probably accounts for this. A dense understory of witch hazel shrubs is known to preclude the maintenance of red oak forests (Curtis, 1959).

Witch hazel, ironwood and white ash are the most important understory species in terms of cover (Table 6). The understory and groundcover of this habitat have many species (see Appendix A). Many native plants like white trillium and solomon's seal survive here and some weedy species like manitoba maple and asters are invading from the edges. White ash is likely to replace red oak as the most important tree species in the future (Table 5).

Breeding birds in this habitat were few; a robin pair and cardinal pair used the area to nest and raise their young. A pair of crows fed their fledgelings high in the oaks of this site. Many species of birds, however, were evident here during migration, such as scarlet tanagers, flycatchers, warblers and kinglets.

The soil of this habitat is similar to the other forested habitats in terms of moisture and organic content (no significant differences; t-test, $p > .05$).

Human use of these woods, other than by property owners, is limited by fences, dense shrubbery, a hill and the swamp at the bottom of the slope.



Plate 6. The Field Border habitat as it appeared in July, 1979.



Plate 7. The East Conifer-Hardwood habitat as it appeared in January, 1980.

Table 9. Quantitative Measures of the Tree Species in the North-facing Oak Wood.

SPECIES	Importance Value	Relative Density	Relative Dominance	Relative Frequency
Red Oak	156.1	41.4	77.8	36.9
Sugar Maple	33.7	13.8	6.9	13.0
Norway Maple	24.3	10.3	1.0	13.0
Hemlock	22.5	10.3	3.5	8.7
Red Maple	21.6	8.7	2.0	10.9
Beech	20.8	6.9	5.2	8.7
Black Cherry	6.3	3.5	0.6	2.2
White Oak	5.3	1.7	1.4	2.2
Yellow Birch	5.3	1.7	1.4	2.2
White Ash	4.1	1.7	0.2	2.2

Table 10. Quantitative Measures of the Understory Species in the North-facing Oak Wood.

SPECIES ¹	Prominence Value	Density (/m ²)	Frequency (%)
Choke Cherry	42.81	5.23	67.0
Virginia Creeper	1.84	0.53	12.0
Zig Zag Goldenrod	0.93	0.35	7.0
Virginia Waterleaf	0.48	0.37	1.7
Sugar Maple	0.30	0.12	8.0
Blue-stemmed Goldenrod	0.30	0.15	5.0

¹ All other species have P.V.s less than 0.2

C. NORTH-FACING OAK WOOD

The forest on the south slope between Bathurst Street and Glencedar Road is typical of a mesic woodland with the characteristic canopy and understory species.

Red oak dominates with an importance value of 156. All trees are larger than 35cm DBH (diameter at breast height) and older than 85 years (Appendix Table B1). Curiously enough, there is no reproduction among oak here. This is due to the necessity of light for oak reproduction (Curtis, 1959). Reproduction is evident in other places where the canopy is more open.

Sugar maple, norway maple and beech are species with fast growth rates, shade tolerance and high reproductive rates. The two maples, through abundant seed crops, and beech through root sprouts (common means of reproduction in beech-Curtis, 1959), appear to be the successors to red oak as dominants (see Table 5). This is a natural occurrence (at least for sugar maple and beech) as these are the climax species for mesic sites in this region (Maycock, 1963; Brown and Curtis, 1952).

Hemlock is the fourth most abundant tree (see Table 9). However, growth is very poor, with very small average size and great average age. Hemlock is a very shade tolerant tree and can withstand suppression like this for long periods (Curtis, 1959). No reproduction is evident in this species either, as it needs sites with very high organic content for germination, such as rotting logs (Curtis, 1959). Red maple appears as an understory species. It seems that it will retain that position in the future (see Table 5).

The understory and groundcover is dominated almost exclusively by choke cherry (see Table 10). Again, this species is a shade tolerant species capable of great vegetative reproduction and hence can readily exploit this habitat. The most obvious difference from the other study site is the low density of understory plants (see Table 2). The density of choke cherry is not significantly different from the other sites (t -test, $p > .05$). However, other plant species are very restricted and their abundance is significantly lower (t -test, $p < .05$). It is later shown that choke cherry is not dependent on elevated light intensity for growth and thus can dominate a site like this.

The bird density in this habitat is quite high with nine species present: common flicker, red-eyed vireo, blue jay, great

Table 11. Quantitative Measures of the Tree Species in the Maple Wood.

SPECIES	Importance Value	Relative Density	Relative Dominance	Relative Frequency
Silver Maple	196.2	63.7	74.6	57.9
Norway Maple	93.1	31.8	24.5	36.8
European Mountain-Ash	10.7	4.5	0.9	5.3

Table 12. Quantitative Measures of the Understory Species of the Maple Wood.

SPECIES ¹	Prominence Value	Density (/m ²)	Frequency (%)
Choke Cherry	26.60	3.43	60.0
Norway Maple	19.50	2.23	76.7
Virginia Waterleaf	5.06	1.60	10.0
Virginia Creeper	4.90	1.20	16.7
Highbush Cranberry	2.37	0.53	20.0
Tartarian Honeysuckle	1.20	0.23	13.3
Goldenrod ssp.	1.04	0.57	3.3
White Ash	1.03	0.23	20.0

¹ All other species have P.V.s less than 1.0

crested flycatcher, cardinal, robin, wood pewee and song sparrow. The large size of this habitat and the availability of nest sites are probably major factors in the presence of these birds.

D. MAPLE WOOD

The maple wood is composed of tree species commonly planted on the streets of Toronto and is probably not of natural origin. Silver maple is found nowhere else in the ravine and norway maples here are the oldest in the ravine (see Table B3). The very even age of all trees of both species (Appendix Table B.3.) on this site indicates that they may have been planted 30-40 years ago to replace the original forest. Silver maple shows no indication of reproduction while norway maple is prolific here (Table 5) as elsewhere in the ravine, and also dominates the shrub-sapling layer (Table 6). White ash is the only other common tree in the sapling and seedling classes. Apparently these two species (norway maple and white ash) will be dominant in the near future.

The understory in this habitat is very similar to the understory of the South-facing Oak Woods (see Figure 3 and Table B.6.) which is located nearby (see Figure 15). The most numerous species is choke cherry, as elsewhere in the ravine, followed closely in importance by norway maple seedlings (see Table 12). Many weedy species occur here, as well as the typical native woodland plants (Appendix A). Burdock, tartarian honeysuckle and canada goldenrod occur along with virginia waterleaf and virginia creeper.

The site has a south-western exposure, relatively complete canopy cover and uniform canopy height. The soil moisture and organic content does not differ significantly (t-test, $p > .05$) from the other three woodland sites (see Soil Section). Of the four main plots the maple wood has the highest average height of shrub layer, lowest tree density and lowest amount of litter cover (Table 2). Norway maple, as a tree, attains a much greater height than the shrubs which dominate the other plots. The relative youth of this stand may explain the low density of trees and low amount of litter (leaf) cover. The importance of oaks and conifers in the other plots may account for their higher degree of litter cover as both oak and conifer litter is resistant to decay (Curtis, 1959).

Bird use of the area was not heavy, but important. A northern oriole, wood thrush and a cardinal utilized portions as parts of their territories. No nests were located within the habitat.

E. SOUTH DISTURBED SLOPE

This slope is very steep and littered with refuse from the yards on its border. Manitoba maple dominates this area with the highest Importance Value recorded in the ravine for any species (see Table 13). In the past, there probably was more mature

Table 13. Quantitative Measures of the Tree Species on the South Disturbed Slope.

Species	Importance Value	Relative Density	Relative Dominance	Relative Frequency
Manitoba Maple	227.8	88.6	66.5	72.7
Red Oak	39.6	3.8	26.7	9.1
Black Locust	18.4	3.8	5.5	9.1
Norway Maple	14.2	3.8	1.3	9.1

Table 14. Relative Density¹ of Understory and Groundcover Plant Species on the South Disturbed Slope.

PLANT SPECIES	Relative Density
Riverbank Grape	34.2
Garlic Mustard	21.6
Goldenrods	9.0
Asters	9.9
Japanese Knotweed	9.9
Norway Maple	6.3
Other Species	9.1

¹ Relative density = density of the species/total density.

vegetation here forming a continuum with the west conifer-hardwood forest. Manitoba maple is a pioneer species being replaced by other species later in succession (Curtis, 1959). It appears that secondary succession is taking place here as well as in several other (floristically) similar habitats. Secondary succession means that after the original vegetation has been removed, other species move into the new conditions.

Other tree species present in this habitat, but not sampled, are eastern cottonwood, tree-of-heaven and staghorn sumac. The former and latter are native species and tree-of-heaven is a weedy introduced species.

The shrub and sapling stratum is very sparse with manitoba maple and elms being most abundant.

The ground layer is dominated by species with high light requirements (i.e. riverbank grape and garlic mustard). The absolute density of trees here is the lowest of the habitats on the west slope.

Birds are not common here although a cardinal and song sparrow often sang from perches close to Heath Street in this habitat. Also families of northern orioles and robins were frequently seen, although singing was never observed here, by these two species.

F. NORTH DISTURBED SLOPE

On the slope below the large apartment building on Bathurst Street is a shrubby area dominated by siberian elm, manitoba maple and black locust. Two of these species are commonly planted aliens, probably invading from the neighbourhoods around Cedarvale. The other, manitoba maple, is characteristic of early successional stages.

The understory is dominated by manitoba maple saplings with small numbers of other species. Japanese knotweed makes its only appearance in the ravine in this habitat.

The groundlayer, like the Field Border, is dominated by garlic mustard and other species requiring higher light levels (see Table 16).

Birds utilizing this site are few. A catbird was the only bird consistently using this as part of its territory. Cardinals and red-winged blackbirds occasionally used the area.

G. FIELD BORDER

On the slopes bordering three sides of the Field (see Figure 15) is an area dominated by manitoba maple, siberian

Table 15. Quantitative Measures of the Tree Species on the North Disturbed Slope.

SPECIES	Importance Value	Relative Density	Relative Dominance	Relative Frequency
Siberian Elm	106.0	35.0	42.4	28.6
Manitoba Maple	86.4	27.5	30.3	28.6
Black Locust	61.1	25.0	21.8	14.3
Scotch Elm	24.6	7.5	2.8	14.3
White Birch	11.5	2.5	2.0	7.1
White Ash	10.4	2.5	0.8	7.1

Table 16. Relative Densities¹ of Understory and Groundcover Plant Species on the North Disturbed Slope.

PLANT SPECIES	Relative Density
Garlic Mustard	25.0
Asters	19.3
Bittersweet Nightshade	13.1
Goldenrods	10.2
Dandelion	8.0
Manitoba Maple	6.3
Grasses	6.3
Other Species	10.7

¹ Relative density = density of the species/total density.

elm and black locust. Manitoba maple dominates the spur ravine and the slope at the foot of Montclair Avenue. Black locust dominates the western edge of the field with crack willow being present at the base of the same slope. Common groundcover species are garlic mustard, goldenrod, avens and asters.

Song sparrow, catbird, robin, northern oriole and red-winged blackbird utilized this area as part of their territories. In addition house sparrows, starlings and grackles used the area by the dozen to forage.

This habitat will probably (if allowed to) expand into the Field and completely engulf it.

H. BOTTOMLAND

The bottomland of Cedarvale has been the most radically altered habitat in the ravine. It was formerly a diverse group of habitat types including a large cedar swamp and cattail marsh. Since the 1940s and 50s there has been a gradual tidying up of the valley floor as well as two eras of drastic change. The first of these changes was the installation of a storm sewer (1968-70) in anticipation of the Allen Expressway. The valley was again dug up (1974-77) to sink the subway beneath the surface of the valley. Consequently white cedar, for which the ravine is named, has been virtually eliminated along with the natural habitat associated with it. The bottomland was restored to a semi-natural state through the lobbying of taxpayers groups and the Ravine Developers (1972). The stream was kept on the surface but reduced to a sluggish, stagnant state. The replanting of the valley floor was generally adequate, with native species planted, usually in suitable habitat, but this is discussed later (see Section 11.A.). Many weedy species have invaded from the surrounding city.

The herbaceous recolonization of the disturbed bottomland is likely reaching its completion. Crowe (1979) found that the colonization of disturbed ground takes place in two phases. For the first $3\frac{1}{2}$ years, species richness is primarily a function of area size and proximity to populations of replenishing species. The large size, relatively diverse habitats, and intimate proximity to sources of colonizing vegetation (i.e. parts of the ravine not excavated) account for the diversity of herbaceous plants observed here. As on the Fill Site at Heath Street, the poor soil quality is probably the major limiting factor where the cover appears sparse and depauperate. This condition, one would expect, will gradually improve as it has on the Field.

I. FIELD

On the tableland at the foot of both Lonsdale Road and Montclair Avenue is the largest (Table 1) open area in Cedarvale. The Field is dominated by grasses and to a lesser extent by other



Plate 8. The Field habitat as it appeared two weeks after mowing in July, 1979.



Plate 9. The North-facing Oak Wood as seen in January, 1980.

herbaceous plants with trees encroaching on the edges. The field was originally an orchard left over from the era of cultivation. Almost all of the trees were killed by the dumping of clay from the Yonge subway construction in the early 1950s (Don Burton, personal communication).

The vegetation is primarily grasses such as red top grass, perennial rye grass, quack grass, and other Agropyron species. Other common herbaceous species include yellow goatsbeard, common milkweed and purple vetch.

Several woody ornamental shrubs are present as are several cottonwoods which are proliferating. Both black locust and manitoba maple are invading from the edges of the Field. This secondary succession is slowed by the mowing of the Field by the City of Toronto.

Bird use of this habitat is limited by the above mowing. Starlings, cowbirds, red-winged blackbirds, grackles and house sparrows forage here but only a pair of red-wings attempted to nest, although unsuccessfully.

American toads bred in the small temporary pool which formed in the middle of the Field. Shortly after the eggs hatched and tadpoles were swimming around by the hundred, the pool dried up.

The soil of the Field is drier than other sampled sites, and the amount of organic content is between that of the bottomland and the forest habitats.

The human use of this area is extensive. Vast numbers of people cross the Field on their way to and from the subway. Many children play and people walk their pets. Hence, many well trodden paths cross the field.

This area is owned by Cadillac-Fairview Corporation which is trying to approve a major housing project centred on this site (see Sec.11.B, esp.Fig.11).

J. FILL SITE

At the southern end of the ravine, just north of Heath Street, was a tableland formed as a result of recent landfill. The soil was extremely stoney and poor, supporting a sparse and patchy community of weeds. Almost every species present was alien and the bulk of the species were mustards and composites in contrast to the grasses which dominate the Field and bottomland. Mat-forming plants abounded, such as silverweed, prostrate knotweed, and black medic.

These weeds produced a large crop of seeds which presumably was responsible for the foraging of large numbers of mourning doves in this area. This stoney, sparsely vegetated habitat was also used by a pair of killdeer.

The land was owned by St. Michael's College, then sold to Cadillac-Fairview Corporation. Recently, construction of an apartment building on the site was begun (see Section 11.B.).

K. WEST CONIFER-HARDWOOD SITE

This site, with its large white pines and white oaks is one of the least disturbed areas in Cedarvale. This is due to a lack of access points and the very steep slope on which it is located.

This habitat is most similar to the East Conifer-Hardwood Site on the opposite side of the valley (see page 14 for discussion.)

White pine, hawthorn and norway maple are the most important trees near the base of the slope, with red and white oaks being more abundant at the top.

Norway maple and witch hazel provide most of the cover in the shrub layer. Choke cherry and zig zag goldenrod are the most numerous understory and groundcover species. Several plants occur only in this habitat in Cedarvale (see Appendix A). Some of these are round-leaf dogwood, white baneberry and beaked hazelnut. These typical native plants have obviously been eradicated elsewhere in the ravine.

Norway maple is the most abundant tree and the most widespread, but all of these trees are young. This is indicated by the species' low relative dominance (i.e. small average diameter; see Table 17). Clearly norway maple will become the dominant tree here as is the prediction for the rest of the ravine. This is a trend apparent in other ravines (see page 45).

In 1979, breeding bird use of this habitat was considerable compared to the surrounding disturbed habitat (see Figure 5). Woodland species such as great crested flycatcher, crow and wood thrush nested here. A pair of cardinals and black-capped chickadees also raised their broods in the relative seclusion afforded by this habitat. The crows, nesting high in a tall white pine, were often harassed by blue jays, red-winged blackbirds and northern (baltimore) orioles.

This area offers birds especially good cover and protection from human disturbance.

Table 17. Quantitative Measures of the Tree Species in the West Conifer-Hardwood Site.

SPECIES	Importance Value	Relative Density	Relative Dominance	Relative Frequency
Norway Maple	39.8	18.8	4.1	16.9
White Oak	50.6	16.7	22.8	11.1
Hawthorn	30.6	14.6	4.9	11.1
White Pine	58.7	10.4	37.2	11.1
Manitoba Maple	25.1	10.4	3.6	11.1
Black Cherry	23.4	8.3	4.0	11.1
Red Oak	28.0	6.2	13.4	8.4
White Birch	19.6	6.2	5.0	8.4
Hemlock	7.6	2.1	2.8	2.7
White Elm	5.3	2.1	0.5	2.7
Butternut	5.1	2.1	0.3	2.7

Table 18. Relative Densities of Understory and Groundcover Plant Species on the West Conifer-Hardwood Site.

PLANT SPECIES	Relative Density
Choke Cherry	48.5
Zig Zag Goldenrod	22.1
Hawthorn	3.5
Norway Maple	4.0
Garlic Mustard	2.5
Field Horsetail	2.0
Raspberry	2.0
Virginia Creeper	2.0
Other Species	13.4

L. SHRUBBY SLOPE

Just south of Cedarvale Park on the south-west slope is an area vegetated predominantly by ornamental plant species. The vegetation is very thick with flowering shrubs being the prevalent plant type. Apple, lilac, mock-orange and european mountain-ash are common shrubs.

Both native and alien plant species are present in the groundcover.

During migration many small birds frequent this site. Warblers, kinglets and numerous other types can be seen here on a pleasant day.

Two bird species nested here in 1979; a robin and a catbird. Both of these species prefer habitat with plenty of shrubbery.

M. WEST SWAMP

Between Glencedar Road and Bathurst Street the stream widens into a heterogeneous wet habitat. Much of the area is dominated by cattails while joe-pye-weed and jewelweed predominate above the water line. There are several dead cottonwoods in the middle, from which a cardinal, red-wing and northern oriole often sang. These dead trees also present an attractive and striking contrast with the vegetation elsewhere in the ravine. They do not present a hazard to path users, and thus, should be allowed to stand.

Several plants occur only here in the ravine. These include marsh marigold, bitternut hickory, norway spruce and white cedar.

Moisture content is obviously high and is significantly (t-test, $p < .05$) different from all other sample sites (see page 89). The high organic content is also significantly different from the other sites sampled, except the north-facing oak wood and East Conifer-Hardwood sites (see page 14 for discussion).

N. EAST SWAMP

Just east of Bathurst Street is another marsh created by a widening of the stream. From the path, one is struck by the large weeping willows. Among these are smaller trembling aspen and white birch. At the base of these trees grow cattails, water hemlock and duckweed.

Behind this vegetation is an area with somewhat less moisture in the soil. Blue-beech, american elm, hawthorn,

pagoda tree and black walnut form the canopy. The ground is blanketed in jewelweed, willowherbs, and fringed loosestrife with small numbers of jack-in-the-pulpit and wild geranium.

Three bird species bred in this habitat in 1979. A male red-winged blackbird with at least two females raised their young in the dense vegetation. Pairs of song sparrows and catbirds used this and adjoining shrubby vegetation as their breeding territories.

O. UPLAND MARSH

From the path, one notices this marsh by the large crack willow trees and red-winged blackbirds singing from perches in these trees.

Along with the crack willows are found sandbar willows, black walnuts, and manitoba maples. The non-woody plants are typical marsh species: cattails, joe-pye-weed, sedges, purple loosestrife and boneset.

P. WATERCOURSE

The watercourse runs the entire length of Cedarvale, at times widening into swampy areas (West Swamp, East Swamp.) The watercourse itself is dominated by narrow-leaf cattail, jewelweed, cutgrass, horsetail, and crack willow (see Table 19), with a multitude of other species present (see Appendix A). The plant community is of recent origin (since subway construction) and is probably in a state of flux. The original flora has been wiped out and a few relics survive. A few white cedars, a bitter-nut hickory and a black ash are reminders of the bottomland forest which occupied most of the valley floor. Tamarack may have also been present before it was reduced in southern Ontario by the larch saw-fly.

The hydrology of the valley has been completely altered. The raised centre portion of impermeable clay soil forces water to flow to both sides and the man-made streambed does not always hold the runoff (see Habitat Map at back of report). As a result there is considerable standing water at the base of the slopes. These areas may, in time, fill in and be invaded by vegetation.

Table 19 . Relative Frequencies of Plants Along the Watercourse.

SPECIES	RAVINE SECTION				
	ENTIRE RAVINE	Hearth to Glenayr	Glenayr to Bathurst	Bathurst to Glen Cedar	Glen Cedar to Park
Narrow-leaf Cattail	12.5	9.3	12.3	10.8	17.5
Jewelweed	10.9	5.8	-	17.6	16.7
Rice Cutgrass	9.9	17.4	8.2	9.8	6.1
Field Horsetail	7.1	2.3	1.4	4.9	16.7
Crack Willow	6.0	1.2	12.3	8.8	3.5
Bittersweet Nightshade	4.6	2.3	1.4	11.8	2.6
Forget-me-not	3.9	1.2	4.1	6.9	3.5
Manna Grass	3.6	10.5	5.5	1.0	-
Broad-leaf Cattail	3.3	8.1	6.8	-	0.9
Bur-Marigold	3.3	1.2	15.1	1.0	-
Reed Canary Grass	2.9	8.1	-	2.0	1.7
Black Willow	2.3	3.5	1.4	2.0	2.6
Hairy Willowherb	2.3	-	2.7	3.9	2.6
Weeping Willow	1.8	-	-	4.9	1.7
Bullrush	1.8	4.7	2.7	1.0	-
Curled Dock	1.8	3.5	5.5	-	-
Water Plantain	1.7	4.7	2.7	-	-
Celery-leaf Buttercup	1.7	-	8.2	-	-
Rush spp.	1.7	2.3	-	-	3.5
Sedges	1.7	3.5	-	1.0	1.7
Other Species (Rel.Freq.<1.2)	15.2	10.4	11.7	12.5	18.7



BOTANY

4. BOTANY

A. INTRODUCTION

Toronto is unique among most modern cities in having a series of wooded valleys crisscrossing the city centre. These wooded areas give the city a character that makes it more livable. Plants have an essential effect on the human psyche. They help us adjust to living in this sometimes hostile environment.

The vegetation of any environment, be it urban or wilderness, is a dynamic system, changing and evolving. In the case of urban natural areas, there is a peculiar dynamic at work. The native flora are interacting with introduced plants, producing an unusual buffer zone between natural forest and the human landscape. Acting in concert with this dynamic, is the natural evolution of any area's vegetation, called succession. Both of these processes are influenced by human use.

Human use tends to favour the weedy introduced plants and those hardy native plants which are able to take advantage of the changing conditions. Human use of woodlands usually results in the removal of some trees and underbrush. This allows weedy plants, both native and introduced, to proliferate because these plants usually require greater amounts of light than provided in mature forests. At the same time, native forest plants are reduced by both an inability to cope with the changing conditions and through competition with the weedy plants.

All of these factors present interesting possibilities for study. We have examined some of these in this section and in the Habitat Descriptions.

B. METHODS

The vegetation of Cedarvale is patchy and heterogeneous so it was necessary to use several methods to characterize the ravine as a whole and also the individual habitats. These methods are divided into qualitative and quantitative types. That is, on the one hand, our subjective impressions and appraisals of the vegetation and on the other, sampling techniques which yield data allowing us to quantitatively assess the abundance and importance of various species.

i. Qualitative

Early in the season, we delimited the ravine into more or less distinct plant communities on the bases of species composition and **physiognomy** (physical structure). These were roughly mapped initially, and later delineated on an aerial photograph from which the area of each habitat was measured. A list of all plant species in each habitat was kept and additions made throughout the field season.

ii. Quantitative

Two basic methodologies were applied to the sampling of woodland habitats. The principal method was to delimit large areas (plots) to sample the trees present and to subsample within these plots for shrubs and herbs. The second method was to use a long narrow strip (belt transect) centred on a tape measure to sample trees. Shrubs and herbs were sampled by identifying and counting the numbers of each species intersecting the tape measure (line transect). The line transect method was also used to sample the vegetation of the watercourse.

The plots, varying in size from 20x30m to 20x60m, were located in the centre of the habitat being sampled. This was done in an attempt to minimize the 'edge' effect. In two of the habitats, the plot occupied almost the entire area covered by the habitat.

The 'count-plot' method (Mueller-Dombois and Ellenberg, 1974), was used for trees. Trees were defined as any upright woody plant with a diameter at breast height (DBH) greater than 10cm. Similarly a sapling has a DBH less than 10cm but greater than 2.5 cm and a seedling has a DBH less than 2.5cm (Curtis, 1959).

Each plot was divided into a series of subplots 3x10m in which every tree was identified, DBH measured, and cored to **determine** age using a Swedish increment borer (Weaver and Clements, 1938). **Coring** involves removing a small drill core, slightly greater **than** the radius

from the tree. The annual rings are counted on the core with no effect on the tree.

From the above data, several phytosociological measures for each species were computed. These were relative density, relative frequency, relative dominance and importance value (Curtis and MacIntosh, 1951). The relative density of a species is simply the total number of individuals of that species divided by the total number for all species combined. This number is multiplied by 100 to produce percentage values.

The relative frequency is the number of subplots in which the species occurs divided by the total of these values for all species in the plot. This is also converted to a percentage value.

The relative dominance is derived from the DBH of all trees. The diameter is converted to the area occupied by the trunk of the tree (basal area) by the formula for the area of a circle:

$$3.14 \left(\frac{\text{DBH}}{2} \right)^2$$

The total basal area (B.A.) for a species is then divided by the total basal area for all species. Multiplying by 100 yields the relative dominance.

A species' importance value for each plot was calculated as the sum of the relative density, relative frequency and relative dominance. Because these are all percentage values, the maximum importance value (I.V.) is 300. The I.V. is very useful because it combines all of the data for each species into one number and thus facilitates quick comparisons.

The ages of all trees were summarized with descriptive statistics (mean, standard deviation, maximum and minimum) for each plot.

Understory₂ and groundlayer flora was sampled using randomly distributed 1 m² quadrats within each community. This "restricted random sampling" (Greig-Smith, 1964) uses random number pairs as coordinates, which are paced from one corner of the plot.

In each quadrat the following information was collected: total number of individuals of each species; the estimated height and radius of cover for every woody plant with height > 75cm; the cover radius of every sapling; estimated leaf and litter cover on the ground; estimated canopy cover; components (species) of the canopy shrub cover. Cover was calculated in a similar manner as B.A. was.

The estimation of litter and canopy cover was based on a scale developed by Kuchler (1967). The categories in this scale are: complete (75-100%), interrupted (50-75%), patchy (25-50%), rare (6-25%), bare (1-5%) and absent (<1%).

Descriptive statistics were produced for litter and canopy cover, height and cover of the shrub layer, and total plant density.

Frequency of occurrence, of a species, obtained by dividing the number of quadrats in which it occurred by the total number of quadrats in the plot.

Density and frequency values were combined to produce prominence values (Beals, 1960). This measure has the same advantages mentioned above for importance value. Prominence values have been applied both to animals and plant populations (Beals, 1960; Douglas and Bliss, 1977). They are derived by multiplying the density of a species by the square root of its frequency.

Transects are often used to examine ecological response to an environmental gradient (Kershaw, 1973). In Cedarvale, the west slope, from Heath Street to Bathurst Street, is very heterogeneous, or patchy. Therefore, we chose to sample the area with a belt transect for trees and a line transect for shrubs and herbs.

The slope was transected using a steel tape measure and the transect divided into 31 sections 15m long. Along each section all trees within 2m of the tape were identified and DBH taken. All herbs and seedlings were counted and summed for each section. Finally, for all saplings and shrubs intersecting the tape, the amount of cover and height of each plant were noted.

The transect data allowed us to calculate I.V. for trees, relative amount of cover for shrubs and relative density for herbs.

A line transect was also used to sample the vegetation of the watercourse. A sample 60m in length was taken from each of the four sections of the ravine: Heath to Glenayr; Glenayr to Bathurst; Bathurst to Glencedar; and Glencedar to Cedarvale Park.

Each 60m section was subdivided into 3m subsections. In each of these, all species present were noted. These data yield absolute and relative frequency of each species.

Statistical analysis of all of the above data was accomplished using the Statistical Package for the Social Sciences (Nie et al., 1975).

C. RESULTS AND DISCUSSION

i. Comparison of Cedarvale with Other Ravines

Cedarvale's plant community fits in a position intermediate between very disturbed ravines such as David Balfour Park and Rosedale Valley and the more natural communities of Burke Ravine and Wilket Creek Park. Quantitative comparisons of Cedarvale with three other ravines (Table 20), including two of the above, illustrate this point. Cedarvale is most similar to Park Drive Ravine floristically as well as in the species composition and diversity of the bird community (see Bird section). In addition, anyone having walked through the two ravines will know that they are similar visually. They have heavily wooded north and south slopes with an unmown centre strip parallel to the stream and gravel path. The surrounding neighbourhoods are similar in having old large homes and mature vegetation.

Cedarvale is unlike other City of Toronto ravines in having a preponderance of red oak on the slopes and white oaks at the tops of these slopes. White ash, norway maple and manitoba maple abound in other downtown ravines. White ash, by far the most abundant species in Rosedale and Park Drive (Kaiser, Gotfryd et al., 1977) is not common in Cedarvale except in one habitat. Norway maples, while abundant in Cedarvale in some places, are young, and will, in the next thirty years, become the dominant in many habitats. It is in the disturbed areas dominated by manitoba maple that Cedarvale most resembles other downtown sites such as David Balfour Park, Rosedale Valley and Moore Park ravine.

Both white ash and manitoba maple are trees of early successional states (Brown and Curtis, 1951). Their dominance in a habitat indicates a return to an earlier successional stage as a result of human disturbance. The position of norway maple is a little more complex. In reproductive rate, shade tolerance and growth rate it closely resembles the sugar maple. It is hardier than sugar maple and hence it is preferred for street planting. It also appears on vacant lots and poor soil as a weed. Consequently, this species can invade both disturbed and shaded forest habitats.

The undisturbed sites in Cedarvale resemble Burke ravine in the forest composition (Kaiser, Gotfryd et al., 1977; Cranmerbyng et al., 1977) with numerous red oaks, sugar maples, basswoods, and hemlocks. However, in 30 or 40 years the canopy composition may be more similar to other downtown ravines as white ash gains importance in the south-facing oak woods and norway maple becomes more abundant in almost every other habitat.

The understories of the four ravines compared in Table 20 are quite similar in species composition. Witch hazel is more abundant in both Park Drive and Rosedale Valley than in Cedarvale

Table 20. Comparison¹ of Cedarvale with Three Other Ravines with Respect to the Plant Species Present.

PLANT GROUP	Park Drive Ravine	Rosedale Valley	Burke Ravine
Trees	83.3	73.5	81.4
Shrubs	72.3	66.7	72.8
Herbs	73.3	59.8	64.4
All Plants	75.3	63.6	68.9

¹ Index is Coefficient of Community, values are given as percentages.

Table 21. Number of Plant Species Present in Four Toronto Ravines.¹

RAVINE	Total Number of Species	Tree Species	Shrub Species	Herb Species
Cedarvale	215	29	34	142
Park Drive	192	25	26	131
Rosedale Valley	137	22	26	82
Burke	232	27	32	153

¹ Certain individual and groups of species were deleted from comparison for various reasons.

and Burke ravines. This may be a result of higher light levels, in the former pair, which is necessary for witch hazel growth. All of the imported species and shade-intolerant species are more common in the three downtown ravines than in Burke.

In the groundcover species comparison, it is clear that the greatest number of weedy species and fewest native woodland species occur in Rosedale Valley and the converse is true in Burke. In both Park Drive and Cedarvale most of these weedy species are present but there are also several undisturbed areas in which the native woodland species survive. Species like trillium, adder's tongue and herb robert have survived in Park Drive and Cedarvale while they have disappeared from Rosedale Valley.

ii. Habitat Comparison Through Ordination

The diverse group of habitats represented in Cedarvale have different degrees of similarity to each other, as the reader may have noted by reading the Habitat Descriptions. In addition, the vegetation of an area is not a series of distinct plant communities, but actually a continuum where various factors cause an increase or decrease in the abundance of many species.

Because of the complexity of explaining verbally the differences among habitats with their many components, we have chosen to represent these habitat comparisons graphically. These graphs are called ordinations (Figures 2 and 3) and the distances between habitats on these ordination diagrams are proportional to their floristic similarity.

An ordination of habitats allows a visual representation of the similarities among all habitats in the ordination. The method we have used, the Bray and Curtis (1957) method, using Sørensen's coefficient of community, has been judged the best from several points of view by Gauch and Whittaker (1973). The coefficient of community (CC) is calculated using the formula:

$$CC = \frac{200(c)}{a+b}$$

a = the number of plant species in habitat a

b = the number of plant species in habitat b

c = the number of plant species common to habitats a and b

These CCs were calculated for the canopy and understory strata for nine and seven habitats, respectively (see Appendix Table B.5.). These were converted to dissimilarity measures (100 - CC) and graphed according to the equations in Beals (1960). The results are presented in Figures 2 and 3. The relationships are quite clear in the canopy ordination (Fig. 2), with some explanation, of course.

Y

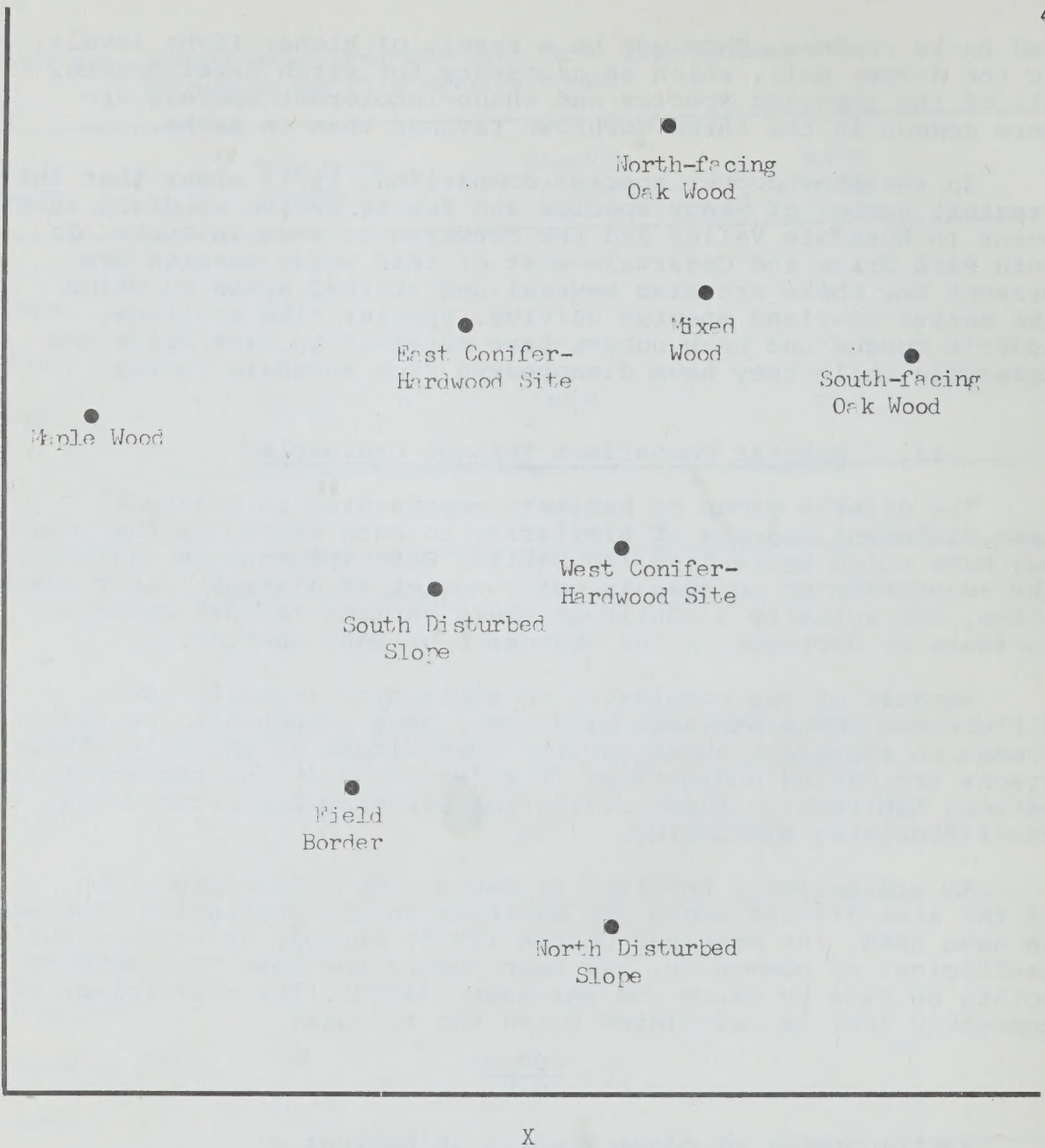


Figure 2. Ordination of the Woodland Canopy Communities of Cedarvale (see text).

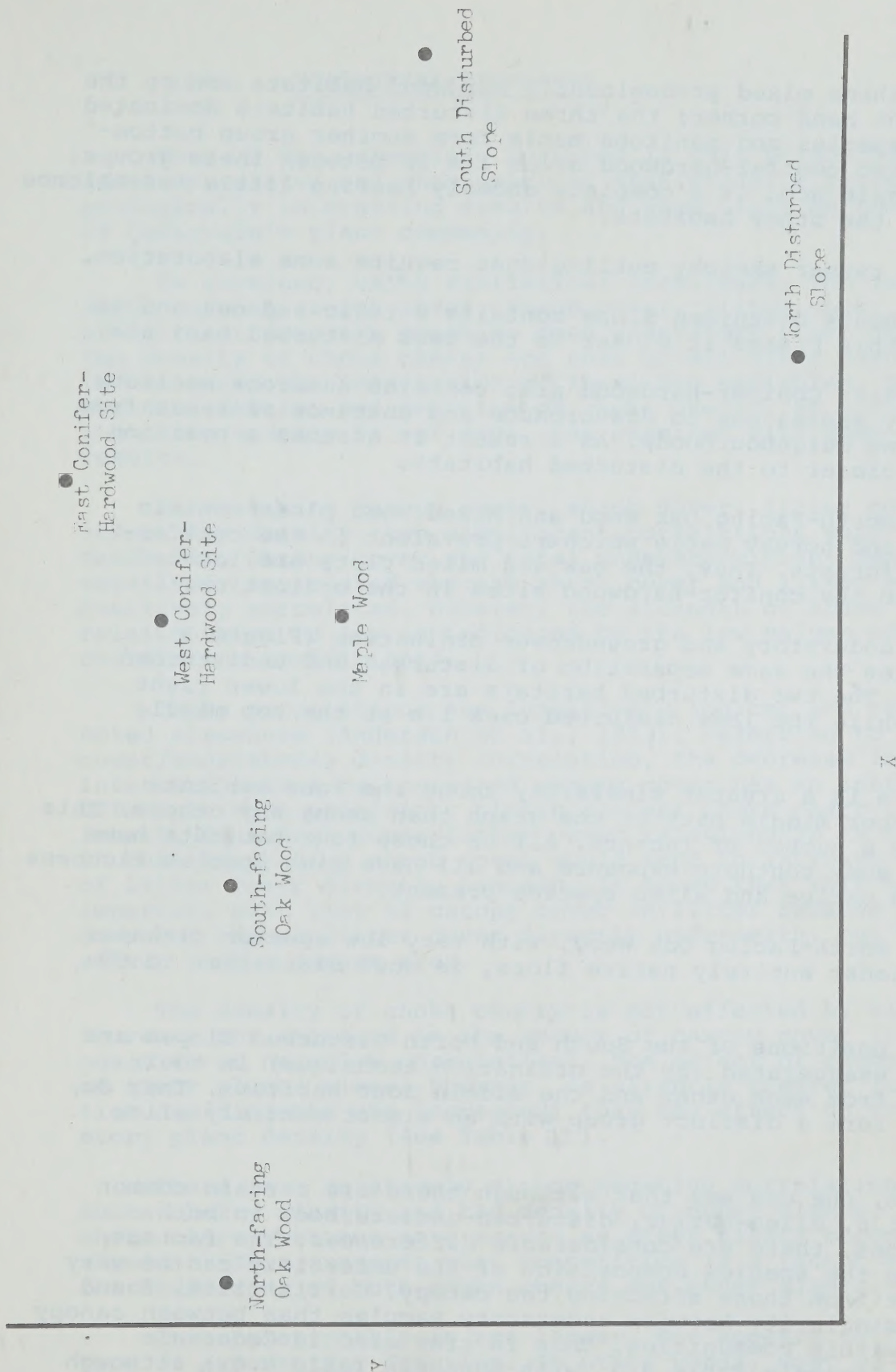


Figure 3 . Ordination of the Woodland Understory Communities of Cedarvale (see text).

The three mixed predominantly hardwood habitats occupy the upper right hand corner; the three disturbed habitats dominated by alien species and manitoba maple form another group bottom-mid; the two conifer-hardwood areas lie in between these groups; and the Maple Wood is a complete anomaly bearing little resemblance to any of the other habitats.

This rather sketchy outline does require some elaboration.

The South Disturbed Slope contains a relic red oak and as a result this places it closer to the less disturbed habitats.

The West Conifer-Hardwood area contains numerous manitoba and norway maples due to disturbance and entrance of seeds from surrounding neighbourhoods. As a result it assumes a position somewhat closer to the disturbed habitats.

The North-Facing Oak Wood and Mixed Wood plots contain conifers and norway maple which are prevalent in the conifer-hardwood forests. Thus, the oak and mixed plots are located closest to the conifer-hardwood sites in the ordination.

The understory and groundcover ordination (Figure 3) illustrates the same separation of disturbed and undisturbed habitats. The two disturbed habitats are in the lower right corner, while the less disturbed ones lie at the top middle to left.

There is a greater similarity among the four habitats in the upper middle part of the graph than among any others. This is due to a number of factors. All of these four habitats have at least some southern exposure and all have high species richness with both native and alien species present.

The North-Facing Oak Wood, with very low species richness and an almost entirely native flora, is most dissimilar to the others.

The positions of the South and North Disturbed Slopes are somewhat exaggerated (by the ordination technique) in their distance from each other and the middle four habitats. They do, however, form a distinct group with an almost entirely alien flora.

Thus, one can see that although there are certain common trends (i.e. alien-native, disturbed-undisturbed) in both ordinations, there are considerable differences. The factors affecting the species composition of the understory can be very different from those affecting the canopy. Curtis (1959) found greater similarity between understory samples than between canopy samples within communities. This is true also in Cedarvale (compare Appendix Table B.5. with Appendix Table B.6.) although not illustrated by the ordination.

iii. Ecological Processes

Many of the parameters measured in this botanical study are interrelated and when examined statistically yielded some ecologically interesting results and shed light on the evolution of Cedarvale's plant community.

We examined, using statistical techniques, the interrelationships between canopy cover, shrub cover, litter cover and understory plant density. Breaking down understory plant density into the density of choke cherry and that of all other plants, we investigated the interaction of these two variables. In addition, the distribution and densities of choke cherry, an ecologically important species in our area, was examined with some interesting results.

In examining canopy cover, shrub cover, litter cover and understory density, two significant correlations were found (see Table 22). Canopy cover and total understory plant density were negatively correlated whereas shrub cover and litter cover were positively correlated. However, the strength of these linear relationships is low as indicated by the low values of the correlation coefficients.

These correlations are intuitively logical and reflect results noted elsewhere (Anderson et al., 1973). Referring to the canopy cover/understorey density correlation, the decrease in light intensity caused by increased canopy cover has an inhibitory effect on most understory plants (except choke cherry, as shown later). The shrub cover/litter cover relationship is logical in that increasing shrub cover would tend to increase the degree of litter cover directly beneath. It seems that this effect is more important than that of canopy cover on litter because canopy cover does not affect litter cover directly underneath, but has an effect over a larger area.

The density of choke cherry is not affected by either an increase nor decrease in the amount of canopy cover (i.e. neither positive or negative correlation). The effect of canopy cover on other plants alone, however, is slightly greater (the correlation coefficients are increased) than the effect on total understory plant density (see Table 23).

There is a relatively strong negative correlation between choke cherry density and the density of other plants. That is, choke cherry becomes more scarce as other plants become more abundant. This suggests that competition is a factor affecting the abundances of both choke cherry and other plants.

This relationship is not linear, but appears to reflect some type of exponential function. In other words, most of the high densities of choke cherry occur where there are very few or no

Table 22. Correlations Between Four Physiognomic Characteristics Measured in all Main Plots.¹

VARIABLE PAIR	Pearson ² Correlations		Kendall ² Correlations	
	r	p	tau	p
Canopy Cover vs. Litter Cover	.0731	n.s.	.022	n.s.
Canopy Cover vs. Shrub Cover	-.0940	n.s.	-.127	*
Canopy Cover vs. Plant Density	-.2388	***	-.155	***
Shrub Cover vs. Litter Cover	.1672	**	.163	**
Litter Cover vs. Plant Density	.0976	n.s.	.037	n.s.
Shrub Cover vs. Plant Density	-.0381	n.s.	.107	*

¹ Pooled data from all four plots, n = 192.

² One-sided significance levels: n.s. , $P > .05$; * , $.05 > P > .01$; ** ; $.01 > P > .001$; *** , $P < .001$.

Table 23. Correlations Between Choke Cherry Density, Other Plant Density and Canopy Cover.

VARIABLE PAIR	Pearson ¹ Correlations		Spearman ¹ Correlations	
	r	P	rho	P
Other Plant Density vs. Canopy Cover	-.2298	***	-.1727	**
Choke Cherry Density vs. Canopy Cover	-.0416	n.s.	.0215	n.s.
Choke Cherry Density vs. Other Plant Density	-.2896	***	-.2582	***
Logarithm of Choke Cherry Density vs. Logarithm of Other Plant Density	-.3450	***	-.3468	***
Square Root of Choke Cherry Density vs. Square Root of Other Plant Density	-.3640	***	-.3530	***

¹ One-sided significance levels: n.s. . $P > 0.05$; ** , $0.01 > P > 0.001$; *** , $P < 0.001$.

other plants and vice versa. Several mathematical transformations of the data were attempted. Only square root and logarithmic transformations increased the correlation coefficients (see Table 23).

The correlation between understory plant density and canopy cover is weak for a number of reasons.

Anderson et al. (1973) found a good correlation ($r = .75$) between light intensity and canopy cover in uniform habitat on level ground. In Cedarvale however, the data is from at least three habitat types and the slope aspect (direction it faces) of each site is quite different. As a result, the amount of canopy cover does not necessarily reflect the amount of light reaching the ground level.

Another confounding effect is the method of canopy cover measurement, in fixed classes (see Methods). Using this method many measurements are underestimations and some are overestimations. The photographic method used by Anderson et al. (1973) allowed for more accurate measurement.

In order to find a more complete understanding of the factors affecting the variation in understory plant density, another statistical method, multiple regression, was employed. Multiple regression measures the combined effect of several variables on a dependent variable while correcting for interactions among the group of independent variables.

Multiple regression was performed using canopy cover and choke cherry density as independent variables, to measure the correlation between these two and the dependent variable, understory plant density. Larger coefficients were generated and hence explain more of the variance of understory plant density. In this case, using the square root transformations (mentioned earlier) of the densities, the amount of variance explained is 19% (see Appendix Table B.7.). A somewhat arbitrary ranking of slope aspect was then added to the group of independent variables. South-facing was given a value of 3, north-facing a value of 1, and southwest-facing one of 2. This ranking has a good correlation itself with understory plant density ($r = .402$). When this is added to the multiple regression, up to 43% of the variance is explained (see Appendix Table B.7.).

Thus, two of the variables affecting the abundance of understory plants (other than choke cherry) are light intensity variation due to the type of exposure of the site and the degree of canopy cover. Competition with choke cherry in areas of low light also affects the density of understory plants as discussed in the following paragraphs.

Choke cherry is the most abundant understory plant in Cedarvale and is ecologically important throughout southern Ontario. Our data allowed us to examine certain aspects of the ecology of the choke cherry.

The distribution of choke cherry was tested for its departure from randomness. That is, we wanted to know if choke cherry individuals were randomly distributed throughout the sample areas or if they were clumped into patches within the sample areas. It was found that choke cherry is heavily clumped, using the chi-square goodness of fit test (Kershaw, 1973). This held true in all four plots and the results were highly significant ($P < .001$ in all cases).

Many woodland plants exhibit a clumped distribution (Curtis, 1959; Whitford, 1951) as a result of clonal reproduction. Vegetative reproduction by choke cherry was quite apparent in Cedarvale, though not quantified. This may be the primary means of proliferation in this type of shaded woodland as flowering was uncommon.

In addition, choke cherry abundance appears not to be related to intensity of light on the forest floor. As mentioned earlier, choke cherry density was not correlated with canopy cover ($r = 0.045$, n.s.; see Table 23) while the density of other plants was. Choke cherry density was also independent of slope aspect ($r = .034$, n.s.), another measure of light intensity.

Thus it appears that choke cherry distribution is probably independent of light intensity within these habitats. This fact alone could be responsible for its dominance in Cedarvale ravine.

iv. Age Study of Oak Trees

Tree ring counts are often used in studies of successional stages in plant communities (Weaver and Clements, 1938), and population dynamics of plant species (Hett, 1971).

The age structure (as well as diameter) of Cedarvale's red oak population (see Appendix Tables B.1-4) indicates that reproduction ceased at least 50 years ago on undisturbed sites. This type of age structure in red oak populations has been noted before. In Wisconsin, Egger (1938) found that red oaks gained dominance in the climax maple-basswood community after a marked disturbance, probably fire. This allowed light levels to increase at the forest floor, which is necessary for reproduction in all oaks (Curtis, 1959).

Of all the oak species, red oak is the most shade tolerant (Curtis, 1959). In Cedarvale, all large white oaks occur on the tops of the slopes where the canopy is often opened up by windfalls. This is an effect noted elsewhere (see Curtis, 1959).

It has been found that in all-aged virgin forest stands there is a good correlation between age and diameter (Gates and Nichols, 1930). In a disturbed urban ravine, Kaiser et al., (1977) found a poor correlation in the dominant species, white ash ($r = .42$).

Table 24 .Age-Diameter Correlations For Red Oak From Two Stands.

SAMPLE	Pearson ¹ Correlations		Spearman ¹ Correlations	
	r	p	r _s	p
North-facing Oak Wood	.454	*	.419	*
South-facing Oak Wood	.108	n.s.	.014	n.s.
Pooled Sample	.525	***	.484	***

¹ One-sided significance levels: n.s. , $P>0.05$; *, $0.05<P<0.01$; ***, $P<0.001$.

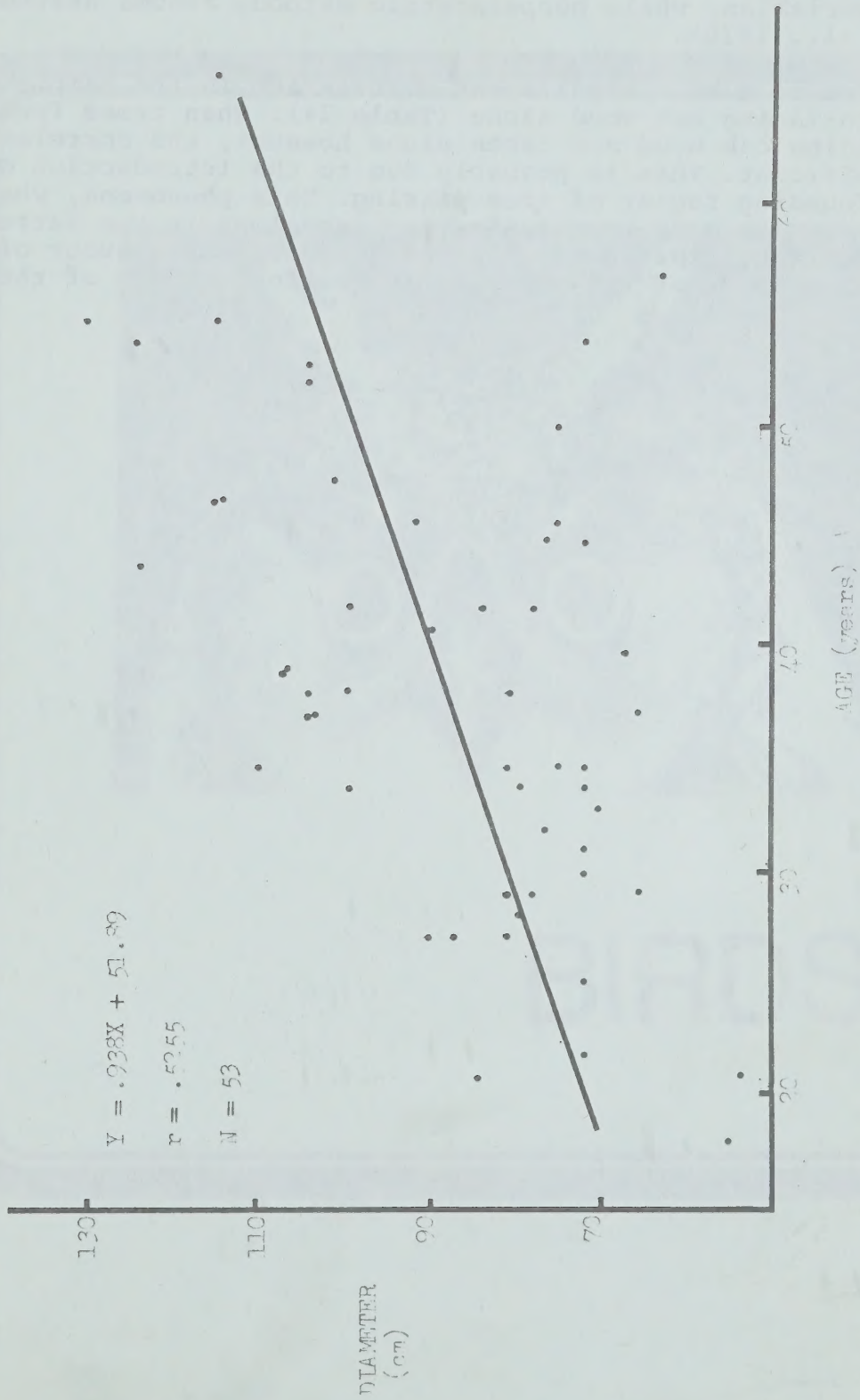


Figure 4. The Relationship Between Age and Diameter Among Red Oaks in Cedarville.

In Cedarvale, the pooled results from the south-facing oak wood and north-facing oak wood yield a significant correlation both with parametric and nonparametric techniques (see Fig.4 and Table 24). Parametric statistics assume a particular type of distribution (normal) and equal variation (variance) in both of the variables, while nonparametric methods assume neither (Nie et al., 1975).

There is also a significant correlation in the sample from the north-facing oak wood alone (Table 24). When trees from the south-facing oak wood are taken alone however, the correlation is not significant. This is probably due to the introduction of the confounding factor of tree pairing. This phenomena, where a tree has two or more trunks, is very prevalent in the latter stand. The partitioning of nutrients may swing in favour of different members of the group during various phases of the life cycle.



BIRDS

5. BIRDS

A. INTRODUCTION

The primary goal of our bird study was to census the breeding bird community of Cedarvale ravine. That is, we wanted to know how many birds of what species were breeding where in the ravine. We also took note of non-breeders that were migrating through the ravine or foraging in it during spring and summer.

Another goal of our bird study was to develop a perspective of Cedarvale's birds in a broader context of space and time. The spatial context is developed using bird census data from other ravines and from the residential neighbourhoods surrounding Cedarvale ravine. Temporal changes are documented using bird data collected over several decades.

For the most part, this section of the report deals with the bird community of the ravine as a whole, without considering which ravine features are important to which birds. For a more finely tuned ecological perspective, we refer the reader to Section 3, which describes the various ravine habitats and lists the dominant bird species of each habitat.

B. CENSUS METHODS

The breeding bird community of Cedarvale ravine was censused according to internationally standardized procedure (International Bird Census Committee, 1970). Eight trips were made to the ravine during the breeding season (June 11 to July 4). Each trip involved two observers walking slowly up one side of the ravine and down the other between dawn and 9 or 10 a.m., giving about 50 man-hours of breeding season observation. Starting points and routes for the trips were varied in order to reduce observation time bias. Five additional trips were made to the ravine during spring migration (April 4 to May 14). On each trip, the location and species of each bird seen or heard was marked on a trip map. Special note was made of territorial behaviour and other evidences of mating.

At the end of the breeding season, data from the trip maps were transferred onto a series of species maps, one map being used for each species. From this compiled data, the number of breeding pairs of each species was estimated. For an eight trip breeding census, three observations of a territorial bird on separate days is considered adequate evidence of breeding (Int. Bird Census Comm., 1970). For early nesting species, the later census trips were deleted from the analysis, and data from the migration trips were included.

In addition to our bird observations in the ravine itself, we undertook street censuses in selected neighbourhoods adjacent to, and a few blocks away from the ravine. Each neighbourhood was censused twice during late May. Census data from streets adjacent to the ravine were sometimes used to corroborate the presence of birds breeding on the ravine edge.

As part of a larger study of winter bird populations in Torontoravines, Cedarvale's bird community was also censused during the winter of 1979-80. Six censuses were conducted using the same mapping method as outlined above. Densities, however, were determined differently. The densities for individual species on each count were summed and averaged, yielding a mean value for each species. These methods are outlined in detail in Kolb (1965).

C. RESULTS AND DISCUSSION

i. Ravine

a. Breeding Census

A total of 70.5 breeding pairs representing 21 species were located by our procedure (Fig.5). Birds of 27 species were present more than once in the ravine during the breeding season (Table 25). In addition, birds of several other species were observed once during the breeding census period (i.e., yellow-rumped warbler, canada warbler, ovenbird, swainson's thrush, northern waterthrush, kingfisher, and white-breasted nuthatch). These are believed to have been non-breeders passing through.

House sparrows and starlings, though perhaps the two most numerous species in the ravine, could not be accurately assessed for breeding using our method since they are non-territorial and colonial (see Kaiser, Gotfryd et al., 1977). Enormous flocks of these birds congregated in the open bottomland and shrubby areas, especially in the southeast portion of the ravine. On one of the breeding census walks, a total of 57 house sparrows and 152 starlings were recorded, most of which were not ravine breeders. A similar situation existed with mourning doves. Large flocks (of up to 34 individuals) gathered on the Fill Site at Heath Street and several of the doves could usually be seen near the Bathurst Street bridge, but we found no evidence of breeding within the ravine. The preferred nesting substrate of this species is spruce, which, though very rare in the ravine itself, is a commonly planted ornamental in the neighbourhood bordering the ravine. Several rock dove families inhabited the underside of the Glencedar bridge, but since the ravine vegetation seemed totally irrelevant to their existence, we have ignored them in this study.

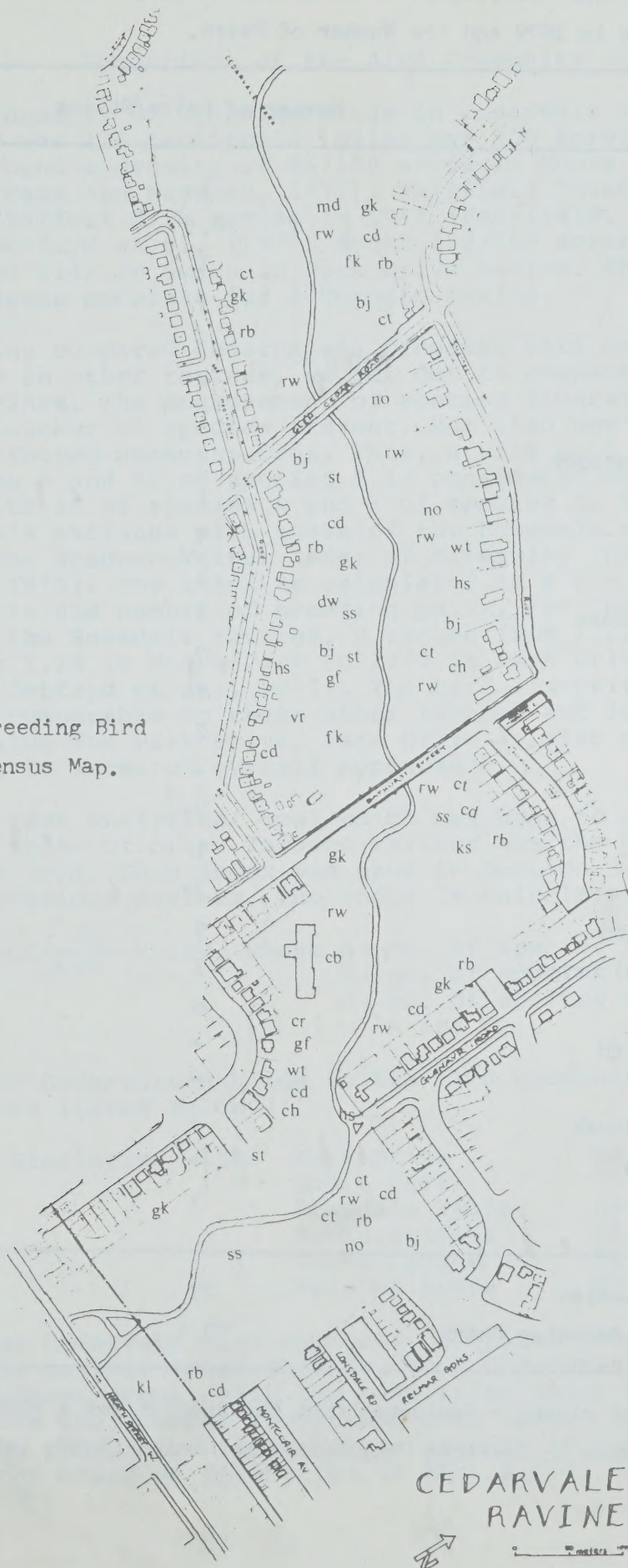


Figure 5. Breeding Bird
Census Map.

CODES

- American Kestrel - ks
- Mallard - md
- Killdeer - kl
- Common
Flicker - fk
- Downy
Woodpecker - dw
- Great Crested
Flycatcher - gf
- Eastern Wood
Pewee - pw
- Blue Jay - bj
- Common Crow - cr
- Black-capped
Chickadee - ch
- Gray Catbird - ct
- American Robin - rb
- Wood Thrush - wt
- Starling - st
- Red-eyed
Vireo - vr
- House Sparrow - hs
- Red-winged
Blackbird - rw
- Northern Oriole - no
- Common Grackle - gk
- Cardinal - cd
- Song Sparrow - ss

Table 25. The Breeding Bird Census of Cedarvale Ravine.¹ All Bird Species²
Breeding in 1979 and the Number of Pairs.

SPECIES	Number of Pairs/Status
Mallard Duck	1
American Kestrel	0.5
Killdeer	1
Mourning Dove	+
Chimney Swift	+
Common Flicker	2
Downy Woodpecker	1
Great Crested Flycatcher	2
Eastern Wood Pewee	1
Blue Jay	5
Common Crow	1
Black-capped Chickadee	3
Gray Catbird	7
American Robin	7
Wood Thrush	2
Cedar Waxwing	+
Starling	3+
Red-eyed Vireo	1
House Sparrow	3+
Red-winged Blackbird	9
Northern(Baltimore) Oriole	3
Common Grackle	6
Brown-headed Cowbird	+
Cardinal	8
Rose-breasted Grosbeak	+
American Goldfinch	+
Song Sparrow	3
Total Number of Species	27
Minimum Number of Breeding Pairs	70.5

¹ If number is not given, + indicates that the species was a visitor.

² Names follow those in American Ornithologists' Union (1957, 1973).

b. Comparison of the Bird Community with Other Ravines

The density of breeding birds in Cedarvale at the time of our study was 133 territorial males per 100 acres. By comparison, Nasmith found a density of 98/100 acres in Moore Park ravine in 1976 (Pace and Nasmith, 1977), Fairfield found 68/100 acres in David Balfour Park ravine in 1969 (Fairfield, 1970), and Kaiser, Gotfryd et al. (1977) found 188/100 acres in Rosedale Valley and 114/100 acres in Park Drive ravine. Thus, Cedarvale's density seems moderate for a Toronto ravine.

Having compared Cedarvale's breeding bird density with densities in other ravines, we set out to compare species diversity among ravines. The measurement of species diversity involves not only the number of species present, but also how evenly individuals are distributed among species. Thus, a site with 50 individuals of species A and 50 of species B is considered more diverse than a site with 99 of species A and 1 of species B. To compare Cedarvale's avifauna with those of the Rosedale ravines, we applied the Shannon-Weiner index of diversity (H) to our data (Pielou, 1975). The index is calculated as $H = - \sum p_i \log p_i$, where p_i is the number of breeding pairs. For Cedarvale, H 1.22. In the Rosedale ravines, H ranged from 1.12 in Rosedale Valley to 1.18 in Moore Park to 1.20 in Park Drive ravine (Kaiser, Gotfryd et al., 1977). The bird diversity in Cedarvale is quite comparable to these other ravines and is most similar to the value for Park Drive. Park Drive is also most similar to Cedarvale in terms of overall appearance.

The last analytical tool which was used to compare Cedarvale's birds to those of other Toronto ravines was the Coefficient of Community (CC). This index was used in Section 3 to compare the pants of various ravines. The index is calculated as:

$$CC = \frac{2c}{a+b} \times 100, \text{ where } \begin{array}{l} a = \text{no. of species in ravine A} \\ b = \text{no. of species in ravine B} \\ c = \text{no. of species common to ravines} \\ \text{A and B} \end{array}$$

The CCs of Cedarvale's birds to the bird communities of other ravines are listed below.

Similarity with:	Park Drive	80
	Moore Park	79
	Rosedale Valley	68
	David Balfour	54
	Burke Ravine	52
	Vale of Avoca	50

Again, the Cedarvale bird community compares most closely with Park Drive ravine. Interestingly, both Cedarvale and Park Drive have an almost identically low similarity value with Burke ravine, which is an undisturbed forest-bottomed ravine in North York. For a striking parallel, compare these results to the ravine comparisons based on vegetation in Sec. 4.C.i.

c. Cats, Birds and Shopping Carts

Feline predation is probably a major mortality factor in Cedarvale as it is in other urban areas (Howard, 1974; Kaiser, Gotfryd et al., 1977). Many cats have been observed hunting in the ravine. A few dead birds, such as a grackle and a wood thrush were found and believed to be cat kills. A feral cat which would not be approached by humans was observed capturing two fledgling song sparrows in two hours by hiding in the garden plot, then leaping several feet in the air to catch them on the wing. Another unusual source of mortality recorded (probably for the first time!) was the destruction of a red-wing nest under the Glencedar bridge by a falling shopping cart.

d. Winter Birds

The winter bird community of Cedarvale is quite diverse, reflecting the diversity of available habitat. Sixteen species occurred during the winter of 1979-80 (Table 26). Although this winter was considerably milder than average, most of the species recorded usually occur here during the winter season (see Appendix Table C.1). Unusually high numbers of mourning doves and the presence of brown thrashers and winter wrens are probably a result of the favourable weather.

Few birds were observed in open areas whereas high densities were noted in shrubby areas with ample cover. Birds also tended to occur on the south-facing slopes on clear cold days (Donna Knauber, personal communication). This undoubtedly due to increased warmth on these slopes, a fact well appreciated by observers engaged in these studies.

A study of the Moore Park Ravine in 1978-79 (Smith, 1980) revealed fewer species and lower overall density. In addition, almost half of this density is due to the presence of a flock of goldfinches. This species is absent from Cedarvale this winter, presumably because of the warm weather, allowing them to winter further north.

Although in many respects the ravines are similar, a much larger proportion of Cedarvale is open space containing cattail marsh, field and shrubby habitat. This diversity of height of the dominant vegetation form is known to increase diversity in avian populations (Lancaster and Rees, 1979).

e. Vale or Isle?

In some ways, a ravine such as Cedarvale provides a habitat island for birds which would otherwise not be found in an urban residential neighbourhood. Habitat features such as marshy areas, forest with leaf litter, meadow vegetation and standing dead wood provide vital food and cover requirements for many species. This fact is illustrated by the comparison of species found breeding in the ravine to those observed in the surrounding neighbourhood (Table 29).

Table 26. Winter Bird Densities in Cedarvale Ravine (1979-80)¹.

SPECIES	Average Density
Mourning Dove	7.8
Downy Woodpecker	1.8
Hairy Woodpecker	0.2
Common Crow	2.0
Blue Jay	3.8
Black-capped Chickadee	6.3
White-breasted Nuthatch	1.1
Red-breasted Nuthatch	0.2
Winter Wren	0.5
Brown Thrasher	0.7
American Robin	2.1
Starling	19.0
House Sparrow	6.2
Cardinal	3.8
Dark-eyed Junco	5.5
Song Sparrow	2.5
Average Total Density	63.5
Number of Species	16
Bird Species Diversity ²	2.04

¹ Data from Donna Knauber (unpublished).

² See text or Pielou (1975) for explanation of diversity index.

On the other hand, the ravine is not like an oceanic island where the community suddenly ends at the breakwater. Birds found breeding in the neighbourhood surrounding Cedarvale venture into the ravine to forage and socialize (especially starlings, house sparrows and mourning doves) just as many birds which find nesting requirements only in the ravine may venture out into the neighbourhood. This is demonstrated by the larger number of bird species seen on streets adjacent to the ravine compared to those seen several blocks away (Table 29).

Even those neighbourhoods several blocks away are visited by ravine birds. A notable example of this is the wandering of the mallard, which bred in the marshy area at the extreme northwest end of the ravine. One morning, a team on a breeding bird census trip incredulously followed the female duck as she, trailed by her orderly brood of eight flightless young, proceeded in an unhesitant manner (suggesting familiarity with the route) across the park, behind apartment buildings, along sidewalks, across roads and lawns, until disappearing into a back yard near Belvedere and Winona. In case they were, in fact, fleeing from us, we at one point circled around ahead of them and waited, but the ducks marched purposefully by us. The object of this head-turning odyssey was not determined.

ii. Neighbourhood Census

a. Methods

Four areas were sampled for birds in the neighbourhood surrounding Cedarvale ravine. These areas were designated as North-near, North-far, South-near, and South-far. North-near and South-near consisted of streets bordering the ravine on the north and south, respectively. North-far and South-far were three to four blocks away. Figure 6 shows the location of neighbourhood census areas.

Each of the four neighbourhood areas were sampled twice in late May and once on July 6. The locations of all identified birds were plotted on trip maps. Sample areas each consisted of a half-mile strip along residential streets.

The North-near and South-near sample areas were comprised of large, old, well-spaced homes with big lots, mature trees and much shrubbery. The North-far neighbourhood was newer, had fewer large trees and less shrubbery. The South-far neighbourhood had the highest building density, scarcest vegetation and the most pavement of the four areas.

b. Results and Discussion

The four neighbourhood sample areas were compared for number of bird species and total number of individual birds observed. The data are summarized in Tables 27 and 28, following.

The near neighbourhoods had the highest numbers of species while the South-far neighbourhood was intermediate in species numbers in late May, but had the same number of species as the near neighbourhoods in July (Table 27).

These results are readily explained by two factors: distance from the ravine and habitat quality. Far neighbourhoods have fewer species than near ones, but North-far is richer in species than South-far because of the better habitat in the North-far area.

Now we turn to a discussion of total numbers of birds observed in each area. The first column of Table 28, below, shows the number of birds observed in each area, averaged over the three census days.

The most birds were observed in the North-near and South-far neighbourhoods. This seems strange at first since the neighbourhoods are so different in terms of habitat quality (see Methods) and number of species (Table 27). Bird density however, may be high with very few species and in very unproductive habitat. The South-far area is a perfect example. As Table 2 shows, although bird density is high, 70% of the birds are house sparrows and 88% belong to three typically urban species. By contrast, only 40% of the birds in the North-near area were house sparrows.

The North-far area had the lowest proportions of house sparrows, and other typically urban birds. This area also had the fewest total birds.

Number of species observed

	early census	late census
North near	11	7
North far	9	7
South near	12	7
South far	7.5	5

Table 27. Numbers of bird species observed in the four neighbourhood census areas.

Neighbourhood	Average # of birds seen per visit per $\frac{1}{2}$ mi.	House Sparrow abundance (% of total)	Combined abundance of Starlings, House Sparrows & Rock Doves (% of total)
North near	85	40	68
North far	44	19	34
South near	52	27	63
South far	88	70	88

Table 28. Densities of all birds and urban birds in the neighbourhoods.

Table 29. Bird species observed in Cedarvale ravine and surrounding neighbourhoods during breeding census.

SPECIES	ravine	streets bordering ¹ ravine	streets 3-4 blocks ¹ away from ravine
Mallard Duck	x		
American Kestrel	x		
Killdeer	x		
Mourning Dove	x	x	x
Rock Dove	x	x	x
Chimney Swift	x	x	
Common Flicker	x		
Downy Woodpecker	x		
Great Crested Flycatcher	x		
Eastern Wood Pewee	x		
Blue Jay	x	x	x
Common Crow	x		x
Black-capped Chickadee	x	x	
Gray Catbird	x		
American Robin	x	x	x
Wood Thrush	x		
Cedar Waxwing	x	x	x
Starling	x	x	x
Red-eyed Vireo	x		
House Sparrow	x	x	x
Red-winged Blackbird	x	x	x
Northern Oriole	x		
Common Grackle	x	x	x
Brown-headed Cowbird	x		
Cardinal	x	x	
Rose-breasted Grosbeak	x	x	
American Goldfinch	x	x	
Chipping Sparrow		x	x
Song Sparrow	x		
Total number of species	28	15	11

¹ - see Figure 6 for location of neighbourhood census areas.

iii. Historical Bird Data

From the 1920s to 1950s Cedarvale-Nordheimer was a well known and well visited bird-watching area. James Baillie helped to popularize the ravine through his "In Birdland" columns in the Toronto Telegram. The accessibility and relatively undisturbed nature of the ravine made it very attractive to naturalists. Consequently a great amount of time and energy was funneled into the documentation of the bird fauna of Cedarvale.

Several written accounts of birds occurring in Cedarvale have been published (Burton, 1949; Helleiner, 1950; Saunders, 1947; Stupart, 1959). The intensity of effort has been more moderate in the recent past, but allows the interpretation of the changes in the bird community present. Records from many sources have been collected with emphasis on the periods from 1930-1950 and from 1969-1979. The result is a comparative list indicating the status of each bird species recorded as occurring in the ravine (see Appendix Table C2).

The results seem to indicate a massive decline in both the numbers of species breeding in the ravine and those present during migration. Much of this decline is due to the alteration of the ravine environment and some due to the inadequacy of recent records. The major changes and their origin are outlined below.

The destruction of the cattail marsh and cedar swamp resulted in the greatest decline in the number of bird species seen in the ravine.

Hérons, bitterns and rails were observed during migration when the above habitats were available. Solitary and spotted sandpipers, once breeding in the ravine have also left with the removal of these habitats.

Numerous species of owls were found in Cedarvale during the 1940s (on the 'Pine Knoll'). Saw-whet, screech and probably great horned owls all bred in the ravine at that time. They have since disappeared (no recent records) probably because of habitat alteration.

Disappearance of breeding purple martins and all other swallows during migration is probably due to the removal of the free flowing stream as well as the spraying of pesticides, both of which cause a reduction in insect abundance (eliminating the swallows main food source).

The lack of recent records of warblers is a result of poor coverage during the migratory periods.

Birds of open grassland areas have completely disappeared. The open park area, from the sports arena north to Ava Road, was not mown in the earlier period (1930-1950) and supported breeding birds like

field sparrow, bobolink and meadowlark, characteristic of open country.

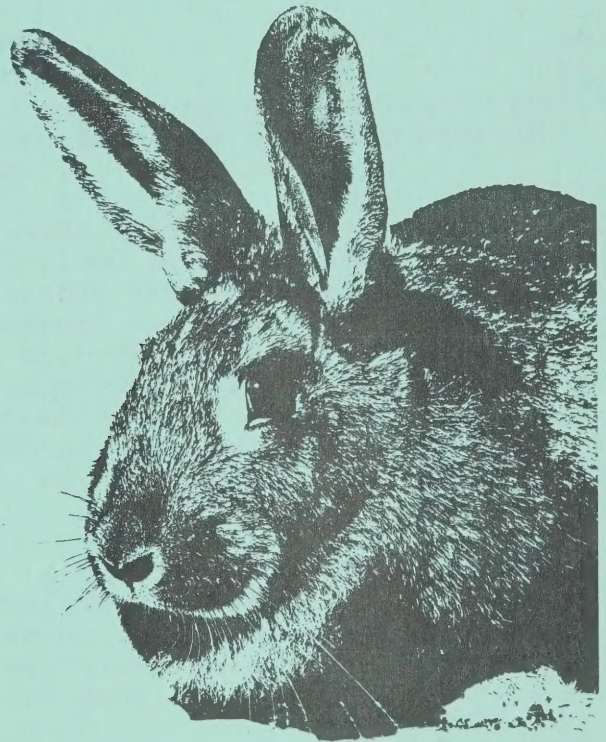
In the winter, species such as snow bunting, common redpoll and purple finch were present, as well as snowy and short-eared owls. These birds of open spaces have disappeared except, in a few cases, during migration.

Most hawks and waterfowl reported in this study as present have been noted flying overhead. Red-tailed hawks and kestrels have been the only resident hawks (winter or summer) recorded in either period of time. Don Burton undertook systematic watches of the hawk migration over Cedarvale in the 1940s. As a result many unusual species such as bald eagle and osprey appear in the list (Appendix Table C.2.).

The only waterfowl actually present in the ravine in either period were the mallard, canada goose and black duck. The black duck has been absent during the last 10 years. This is due to a general decline throughout the province (see Alison, 1976).

Although insufficient recent data accounts for some of the decline in observed numbers of bird species in Cedarvale, the massive alteration of the environment since World War II has been the major factor in this decline.

Mammals



6. MAMMALS

In this section, we are concerned with determining which species of small mammals currently exist in Cedarvale ravine, the locations of those species within the ravine, and the abundance, where possible, of those species. We also compare our data with historical mammal data.

A. METHODS

Presence of species and also estimates of abundance were determined using capture-recapture data and also information provided by incidental sightings.

Mammals were live-trapped using Hav-a-hart traps (dimensions 18"x6"x6", suitable for squirrel sized animals) and also Sherman traps (dimensions 12"x3"x3", suitable for mouse sized animals). In each trap the mechanics of capture are the same: attracted by bait, an animal enters via a trap-door and then depresses a treadle lever which snaps the door shut. For bait, walnuts were used in Hav-a-harts and a combination of peanut butter and oatmeal was used in Shermans. Captured animals were identified as to species, then sexed, aged, ear-tagged and released at the point of capture.

Because most of the ravine is unsuitable as small mammal habitat, low numbers of individuals were assumed to be resident within the ravine. Therefore, random sampling was not used to determine trap locations. Instead, traps were set out in those areas seen as most likely to yeild positive results.

Sherman traps were set during the day, left overnight, and checked the next day. Sherman trap transects ranged in size from 5 to 10 traps with 10 traps being the most common. Transects were run in approximately straight lines although contours of hills were followed in all cases. Traps were placed every 10 to 15 yards, a standard distance in small mammal trapping. In any area, after 40 to 50 trap nights, with no animals caught, or, after sufficient catches to provide data for the estimation of abundance occurred, trapping was discontinued and begun elsewhere.

Hav-a-hart traps were placed throughout areas in which squirrels seemed to be common. These traps were checked at least once per hour for squirrels. Trapping in an area was continued until an estimate of abundance could be made, after which trapping was discontinued and begun elsewhere.

B. RESULTS

i. Mice

Capture of these small mammals was markedly unsuccessful. Out of 607 trap-nights, 14 white-footed mice were captured, and 7 of these individuals were recaptured for a trap efficiency of 21/607, or about 3%. No other species of small mammal were captured. Fig. 7 shows the location of traplines, the number of traps used, the number of nights trapped and the success of each trap-line.

Using the Lincoln Index (for discussion see Pielou, 1977) captures and recaptures on any given night provided estimates of abundance ranging from 0 to 14 for any given line. It would therefore appear that there are very few white-footed mice in Cedarvale and almost certainly no other microtine rodents.

ii. Squirrels

Capture of squirrels was relatively successful. Trapping was done almost exclusively in the areas shown in Fig. 7. A total of 32 squirrels (22 black, 3 mottled, and 7 gray) were captured of which 14 were recaptured.

In area A, estimates using the Lincoln Index were obtained of from 33 to 46 squirrels ($\bar{x} = 38, sd = .24$). In area B, 3 squirrels were caught but none were recaptured, so no estimate of abundance is possible. In area C, seven squirrels were captured but none were recaptured, so no estimate of abundance is possible. It is clear though that area A contains many more squirrels than areas B or C, and that elsewhere squirrels occur only sporadically.

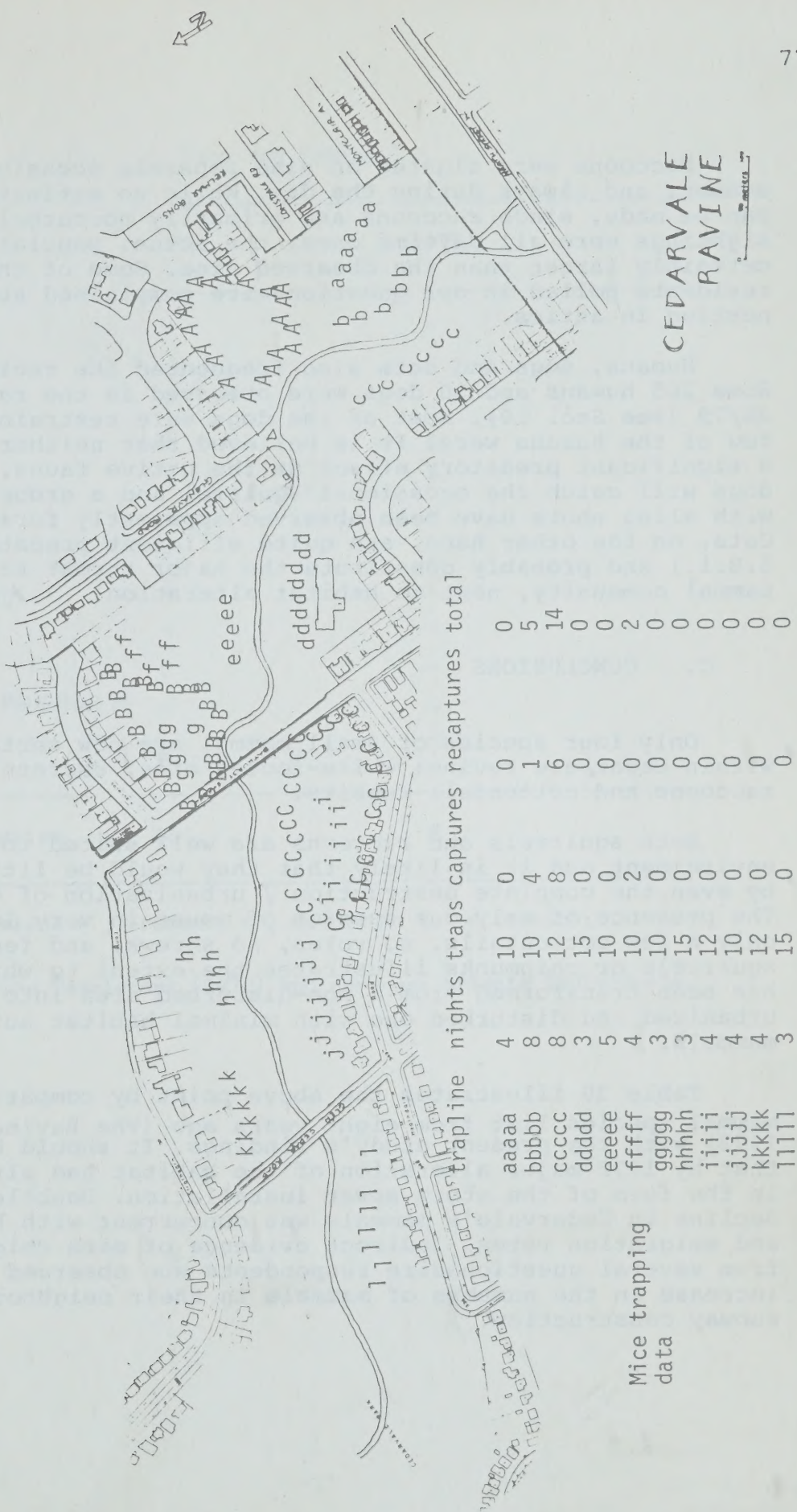
Theft of traps was a serious problem. Seven Hav-a-hart traps were stolen or destroyed (\$30. each) and 26 Sherman traps were stolen or destroyed (\$5. each). On one occasion an entire trapline of Shermans was stolen. As a result, mammal censusing was terminated earlier than it would have been otherwise, which is why no estimates of abundance are available for areas B and C.

iii. Other Mammals

Aside from the squirrels and white-footed mice discussed above, we also observed raccoons, cottontail rabbits, and bats. Reported observations of red squirrels, chipmunks and groundhogs were numerous from questionnaire respondents (Sec. 9) but none were encountered by our study team. One local resident provided us with a rather dubious report of a flying squirrel.

Squirrel trapping data	Area		captures		recaptures		total all
			black	mottled grey	black	mottled grey	
A	16	4	2	8	1	2	33
B	3	0	0	3	0	0	6
C	5	1	1	0	0	0	7

Figure 7. Small mammal trapping data



Mice trapping data

Area	captures	recaptures	total
A	10	0	10
B	10	1	11
C	12	6	18
D	15	0	15
E	10	0	10
F	10	2	12
G	10	0	10
H	15	0	15
I	12	0	12
J	10	0	10
K	12	0	12
L	15	0	15

CEDARVALE
RAVINE

Raccoons were sighted on nine separate occasions during the summer, and always during the day. While no estimate of abundance can be made, since raccoons are primarily nocturnal animals and sightings were all daytime ones, the actual population is almost certainly larger than the observed nine. Some of the neighbourhood residents polled in our questionnaire complained about raccoons nesting in attics.

Humans, dogs and cats also frequented the ravine, of course. Some 265 humans and 30 dogs were observed in the ravine on July 28/79 (see Sec. 10). Most of the dogs were restrained, but very few of the humans were. It is believed that neither species has a significant predatory effect on the native fauna, but some dogs will catch the occasional squirrel and a group of children with sling shots have been observed apparently foraging for birds. Cats, on the other hand, are quite efficient predators (see Sec. 5.B.i.) and probably constitute the major threat to the small mammal community, next to habitat alteration.

C. CONCLUSIONS

Only four species of small mammal are now certainly found within Cedarvale ravine: white-footed mice, eastern gray squirrels, raccoons and cottontail rabbits.

Both squirrels and raccoons are well suited to the urban environment and it is likely that they would be little affected by even the complete destruction / urbanization of the ravine. The presence of only one species of mouse in very low numbers, only a few cottontails, no voles, no shrews, and few or no red squirrels or chipmunks illustrates the extent to which the ravine has been transformed from a non-disturbed area into a heavily urbanized and disturbed one with minimal habitat suitable for small mammals.

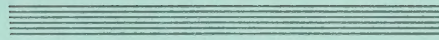
Table 30 illustrates the above point by comparing the mammal species list from eight years ago (The Ravine Developers, 1972) with the present study's findings. It should be noted that by 1972 major alteration of the habitat had already occurred, in the form of the storm sewer installation. Doubtless, the decline in Cedarvale's mammals was concurrent with high mortality and emigration rates. Indirect evidence of mass emigration comes from several questionnaire respondents who observed a transient increase in the numbers of mammals in their neighbourhood during subway construction.

Table 30. Mammals of Cedarvale: Past and Present.¹

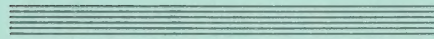
SPECIES	1972 ²	1979
(Little Brown) Bat	*	*
Raccoon	*	*
Red Fox	*	-
Cottontail Rabbit	*	*
Groundhog	?	?
Gray Squirrel	*	*
Red Squirrel	*	-
Chipmunk	*	-
House Mouse	*	*
White-footed Mouse	?	*
Meadow Vole	?	-
Norway Rat	*	?
Total Number of Species	12	8

¹ Status is indicated: * , present; ? , suspected to be present;
- , absent.

² Sources are Ravine Developers (1972) and numerous private individuals.



REPTILES and AMPHIBIANS



7. REPTILES AND AMPHIBIANS

Cedarvale is conspicuously lacking in reptile and amphibian fauna. It is known that these animals are extremely sensitive to urban development (Campbell, 1974; Minton, 1968) and disappear rapidly. The ravine has been isolated from repopulation, via the Don Valley, for a considerable length of time.

No systematic sampling methods were used to estimate the presence or abundance of these creatures and only our opportunistic observations are available. Notes were kept on all sightings of reptiles and amphibians in the ravine.

The only amphibian noted as present was the american toad. It was common in the southern portion of the ravine and bred in various places, as evidenced from singing and our observations of copulating pairs. The most notable breeding site was in the pond directly west of the Glenayr access, at the foot of the slope. Other sites included a small temporary pond in the Field, where tadpoles were common.

Two species of snakes were noted during the summer's field work. Three eastern garter snakes were observed -- two in the Field and one in the South-facing Oak Wood. Two dead Dekay's snakes were found on the path near Bathurst and a live specimen was seen in the Field.

The composition of the reptile and amphibian fauna of Cedarvale is similar to that of the Rosedale ravines as indicated in Kaiser, Gotfryd et al., (1977). The factors mentioned above plus heavy public use and the major disruption of the bottomland for subway construction are probably all responsible for the scarcity of reptiles and amphibians in Cedarvale ravine.

Soils

8. SOIL

A. INTRODUCTION

Basic to all terrestrial ecosystems is soil. Life, both floral and faunal, may be viewed as an elaboration of this physical world. Organisms receive vital nourishment from the physical world, but, on the other hand, their distribution and abundance are limited by the physical environment.

Most of the vital mineral exchange between the living world and the inorganic world occurs in the soil. The development of soil properties is influenced by the activities of plants and other organisms. The role of plants and animals in maintaining soil characteristics is shown most dramatically when communities are disturbed. For example, removal of vegetation from slopes causes erosion which alters drainage. Organic and inorganic nutrients are washed away, and nutrient input from plants or animals becomes minute. Many decades will pass before ecological conditions approach those present at the time of vegetation removal.

The nine areas within Cedarvale chosen for soil study span a range of habitat from natural woodland to swamp to grassland. Our soil analyses demonstrate that the nature of the vegetation in a given habitat is reflected by soil characteristics. Where the vegetation is modified the soils will respond. Conversely, when important soil features are altered, the vegetation is affected. Of course, if soils, vegetation and drainage are all radically disturbed, as is the case in Cedarvale's bottomland, then ecological recovery to a diverse natural situation may take several decades, if it happens at all.

B. METHODS

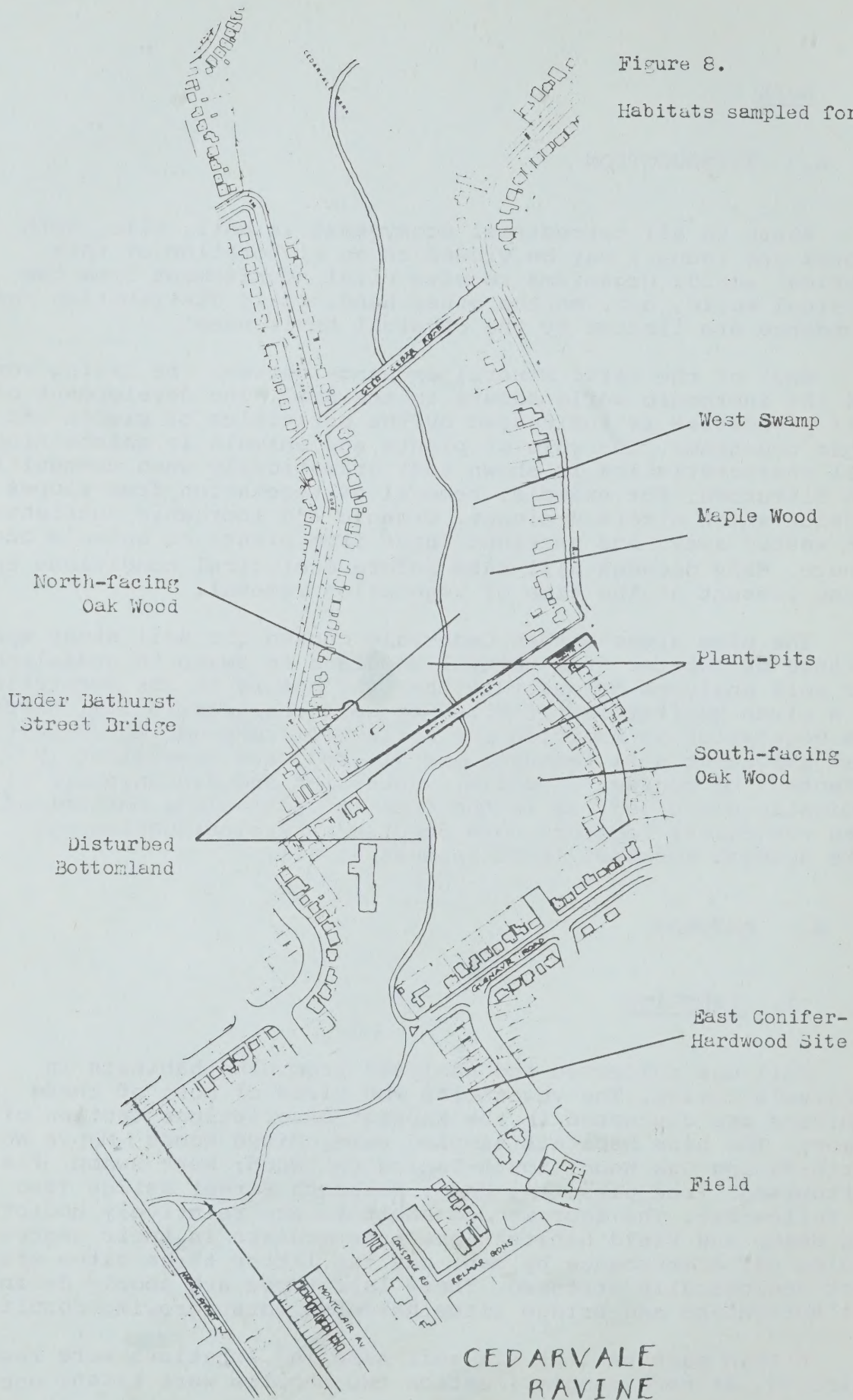
i. Sampling

Soil was collected and analysed from nine habitats in Cedarvale ravine. The vegetation and birds of most of these habitats are discussed in the Habitat Descriptions section of this report. The nine habitats sampled were: Mixed Woods; Maple Wood; North-Facing Oak Wood; South-Facing Oak Wood; West Swamp; Field; Bottomland; Tree-pits; and Under Bathurst Street Bridge (see Fig. 8, following). The four wooded habitats are relatively undisturbed; the Swamp and Field habitats are intermediate in their degree of ecological disturbance by man; and the latter three sites are the most ecologically stressed. These last three are poorly drained. The Bottomland and Bridge sites have the worst growing conditions.

Within each habitat six soil sampling locations were randomly selected. At each sample location two samples were taken, one at

Figure 8.

Habitats sampled for soil.



the surface (0 cm.) and one at 10 cm. below the surface. Thus, we had collected 12 samples from each of nine habitats. All 108 soil samples were collected on the afternoon of July 20/1979, four days after the last rain. The dry period prior to sampling allowed us to better compare the water retention of the soil in different habitats.

ii. Laboratory

All 108 samples were subjected to tests for colour, organic content, water content. About half of these samples were further analysed for texture, acidity and concentrations of five major nutrients -- namely nitrogen (N), phosphorous (P), potassium (K), sodium (Na), and chlorine (Cl).

a. Colour

In describing an area and its soil, the colour of the soil is usually one of the first observations noted and recorded. Munsell colour notation allows us to describe the colours we see using standard colour charts. The soil colours were categorized according to their hue (their relation to red, yellow, green, blue, or purple), their value (lightness), and their chroma (strength or departure from neutral). The condition of the soil, either dry or moist, was also recorded, as moisture has an effect on the colour.

b. Texture

Soil texture refers to the relative proportions of sand, silt and clay in each sample. Each of these "soil separates" render characteristic properties to the sample's feel and stickiness, its ability to form balls and rolls, its plastic nature, its muddiness, and its consistency. The samples are then classified into soil texture classes, following a system designed by the soil survey staff of the U.S. Department of Agriculture.

c. Moisture Content

All of the samples were wrapped air tight and the estimations of moisture content proceeded soon after sampling so that the results reflected the actual moisture content of the soil on that occasion.

The difference between the weights of each sample initially and after drying is due to evaporation of water from the sample. This amount is expressed in percent as:

$$\% \text{moisture content} = \frac{\text{initial dirt wt(g)} - \text{dry dirt wt(g)}}{\text{initial dirt wt(g)}}$$

d. Organic Content

Organic matter increases the water and nutrient retention of soils. It also acts as a buffer between acidity and alkalinity. It is an important source of nitrogen and phosphorous, and aids in the detoxification of pesticides. Thus, the productivity or fertility of a soil usually increases with increasing content of organic material.

The method used to determine the organic content involved ignition and combustion of the dried samples in a muffle furnace. The loss of weight due to ignition is presumed to reflect the release of organic carbon as carbon dioxide and water. The values obtained with this method are somewhat approximate measures because of the volatilization of substances other than organic materials. The relationship is expressed as:

$$\% \text{organic content} = \frac{\text{dry dirt wt(g)} - \text{ignited dirt wt(g)}}{\text{dry dirt wt(g)}}$$

e. Nutrient Content

Selected samples were analyzed for specific elements using various extraction methods. The reagents used induced a colour in the extraction, the strength of which directly reflected the concentration of that element in the solution. This was measured colourimetrically using a spectrophotometer, specifically, an Auto-Analyzer. Calculations were made to express the nutrient content as micrograms (μg) or milligrams (mg) of nutrient per gram (g) or original soil ($1\text{g} = 10\text{mg} = 10^3 \text{ g}$, $\mu\text{g/g}$ is therefore parts per million or ppm).

Total (both soluble and insoluble) nitrogen and phosphorous were extracted using a sulphuric acid/potassium per sulphate mix. After colourimetric analysis, their concentrations in the soil were expressed in milligrams per gram (mg/g). Water-soluble potassium, sodium, and chlorine were extracted in a 1:10 mix with water. The calculation of micrograms per gram ($\mu\text{g/g}$) was based on dry weight. The statistical methods used in analyzing the nutrient data are discussed in the preamble to the nutrient results (Sec.8.C.v-vi.).

f. Acidity

The acidity of a substance is measured by its concentration of hydrogen ions. pH is defined as the log of the reciprocal of the concentration of hydrogen ions, that is:

$$\text{pH} = \log \left[\frac{1}{\text{H}} \right]$$

Thus, the lower the pH, the greater the concentration of hydrogen ions or acidity. (Neutral is a pH of 7).

The hydrogen was removed from the soil with a 1:4 dilution of calcium chloride (CaCl_2). The solution was measured using a pH-meter with a glass electrode. The readings from the pH-meter were used directly and were expressed in pH units.

C. RESULTS AND DISCUSSION

i. Colour

Overall, the soil of Cedarvale ravine is roughly grayish-brown in colour, but varies around this. The West Swamp habitat had very dark and mucky soil, distinctly differing from the rest of the sampled areas. The habitats which showed the greatest soil colour variability were the disturbed habitats of the valley floor. These three habitats -- Bottomland, Tree-pits, and Under Bathurst, ranged from very dark to pale and from brown to gray.

ii. Texture

Of course, consideration of soil colour should be in conjunction with the estimation of the soil composition itself, for the colour is an expression of the nature of the soil.

The soils from the wooded sites were found typically to be of loam, which is composed of mostly silt and sand, with some clay. This soil at times tended towards sandy loam. The West Swamp soil ranged between loamy sand to silty clay. This mucky stuff usually held generous amounts of sand and silt, except for once when it was found to be a solid clump of silty clay. The Field varied closely between loamy sand and sandy loam. The disturbed Bottomland site held high amounts of silt and clay in its silty clay loam. The Plant-pits were composed more of clay, as exhibited by its clay loam, as was the Under Bathurst site. Often a layer of speckled sand covered parts of the latter site. This sand was brought into the ravine from several points of outwash from the Bathurst Street Bridge.

iii - iv. Moisture and Organic Content

We discuss these two soil parameters together because we have found, as is generally the case, that organic content of the soil is closely related to moisture content. Analysis of the scatter-gram (Fig.9) relating these two variables demonstrates that the organic content is significantly related to moisture ($r = .65$) for each habitat.

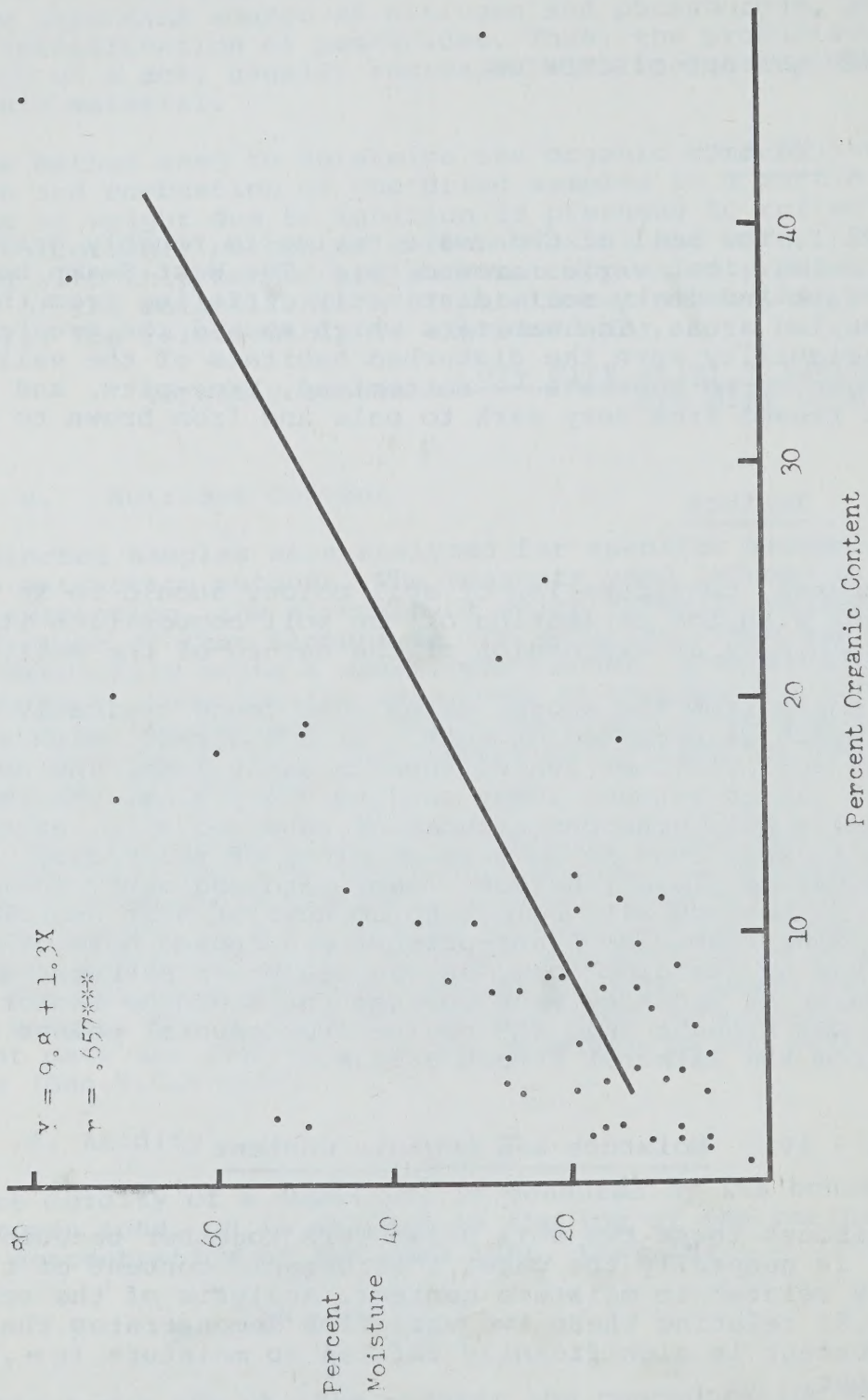


Figure . The Relationship Between Moisture Content and Organic Content in Cedarvale's Soil.

The mean values of these two variables are presented in Appendix Table D1. As was expected, the West Swamp, with its saturated soil, held the highest amount of moisture of all the habitats sampled, at 52 to 60% water by weight. Due to its location at the base of the slope and to its anaerobic conditions, the wetland was also the site of highest organic content at 21% to 22% by dry weight.

With respect to moisture content, the soils of the other habitats varied between 10 and 20%. The lowest soil moisture values were found in the Field (8-10%). The results of organic content analysis generally parallel those for moisture content. All habitats had much less organic matter than the West Swamp and mean values for most habitats fell between 4 and 12%. The Field had only 3-4% organic content and the Bottomland habitat was even lower. Despite this extreme lack of organic material the soil of the Bottomland habitat held as much moisture as any of the wooded habitats. The relatively poor drainage of the Bottomland soil is due to its high silt and clay content which is likely a result of the deep churning of the sub-soil during subway construction. The Field had a sandier soil and, thus, retained less water.

The Plant-pits site held even more moisture than the surrounding disturbed bottomland, and this was due to an even greater amount of clay in its soil, which might be thought unusual topsoil in which to plant trees and shrubs.

v - vi. Nutrients and Acidity

a. Preamble

Each of the nine sampled habitats were tested for some of the more important nutrients required in significant amounts for plant growth and development. Nitrogen is a structural component of proteins, and of nucleic acids which are essential for protein synthesis. Nitrogen is also an integral part of metabolically important compounds essential for photosynthesis and respiration. Phosphorous is found in plants as a constituent of nucleic acids, phospholipids, the molecules NAD and NADP, and, most importantly, of ATP, used in the conversion of energy within living cells. The specific role of potassium is not yet known, though its deficiency affects such varied processes as respiration, photosynthesis, chlorophyll development, and water content of the leaves.

Sodium and chlorine were the other mineral nutrients measured and are essential in trace amounts for the growth of some plants. Availability of these nutrients is almost never a problem for plants. The interest in these two elements by this study is mainly for their suspected accumulation and toxic effects on vegetation in the Under Bathurst Street Bridge habitat.

The concentration of hydrogen ions, measured as pH, determines the degree of acidity of the soil. This in turn influences the rate at which all nutrient ions are assimilated into the plant tissues from the soil. The concentration of hydrogen ions affects the equilibrium between the soil solution and the exchangeable nutrient cations bound on the negatively charged surfaces of clay and organic matter particles. Hydrogen itself is a major requirement for plant growth and development. In fact, the presence and activity of hydrogen pervades throughout the entire plant. Because of this, pH is also discussed in this section.

After the results of the lab extraction and analysis became available, statistics (multivariate analysis of variance or MANOVA) were used to see how nutrients varied among sites and between high and low soil samples. More specifically; we are concerned here with: whether the concentration of each element was different among the various habitats; whether there was any evidence of leaching or accumulation through the soil at the 10 cm. level; and whether there is a detectable pattern in the distribution of each element with respect to both habitat and level. The criterion used for each condition being looked at involved the F-distribution. What is important to know here is that when the critical or tabulated F value exceeds the predicted or experimental F value by less than 5%, reflecting 95% confidence intervals, then the two parameters being looked at, say nitrogen and site, are said to be "significantly" related; that is, nitrogen varies significantly between sites. If the predicted F is exceeded by the critical F by less than 1% (99% confidence intervals) then, say, nitrogen and site vary "highly significantly" with each other. 0.1% reflects 99.9% confidence intervals and is said to be "very highly significant". Anything less than 95% confidence is not enough to be declared statistically significant, though it may be noted as a possible trend.

A limitation of the F-test is that although it tells us that there are significant differences, it does not tell us where these differences are. Thus the F-test does not reveal in which sites an element was found in the greatest or least concentrations.

b. Results and Discussion

Looking at the results, (see Appendix Tables D.2. and D.4.) nitrogen, phosphorous, sodium, chlorine and pH (in fact, all except potassium) were highly to very highly significantly related to site. Potassium seemed to be evenly spread throughout the ravine, while the observed concentrations of the other elements depended on the particular habitat.

The suspected high concentrations of sodium and chlorine at the Under Bathurst Bridge site were well confirmed. This area had some unusually high concentrations of salt, reaching almost as high as 0.2% or 2 parts per thousand. This considerable amount caused one soils expert to inquire as to whether this area had been used to store salt.

Phosphorous was the only element to be highly significantly related to level, that is phosphorous exhibited a highly significant difference in concentration in the soil between the surface and 10 cm. down. From the original data, we find that phosphorous concentrates mostly at the surface, and is less lower down. The other elements showed no marked relation to level.

None of the elements showed any relation to habitat and level. That is, there was no detectable interaction between habitat and level, in determining the concentration of any of the nutrients.

To determine any correlation between nutrients, in that some might occur together no matter what the site, a method was employed using the General Linear Model for Multiple Regression. This resulted in a matrix (Appendix Table D3) which listed the extent of similarity between the distributions of different elements. Nitrogen and phosphorous concentrations vary together in a highly significant manner. So do nitrogen and potassium. But, phosphorous and potassium do not. Phosphorous and sodium are significantly associated. Sodium and chlorine concentrations are very highly significantly a function of each other. However, phosphorous and chlorine are almost related significantly, but not quite. Thus, the notable correlations between nutrients, regardless of habitat, are between nitrogen and phosphorous, nitrogen and potassium, phosphorous and sodium, and sodium and chlorine.

The next phase in the statistical analysis involved the grouping of like habitats into site-types, and their MANOVA was then used again to give the degree of relation between site-type and each of the elements. The nine habitats were grouped into four site-types. The intent here was to determine to what extent the four wooded habitats grouped as one site-type, would differ in nutrient content from three disturbed sites, grouped as another site-type. The three habitats included in the disturbed site-type were Bottomland, Tree-pits and Under Bathurst Street Bridge. The West Swamp and Field habitats were included in the analysis and were each considered a site-type unto itself.

The results from this test (Appendix Table D.2.) indicated that nitrogen, phosphorous, sodium, chlorine, and pH (again, all except for potassium) related, on the whole, very highly significantly to site-type. Only potassium did not and was therefore, evenly distributed between site-types. Knowing that the elements varied so well with respect to the site-types, (in fact, more dramatically than among ungrouped habitats) we might say that these site-types differ enough to refer to each almost as an entity. Thus, the wetland, the woods, the field, and the disturbed areas all differ quite alot from each other. But as mentioned before, this test does not tell us where these differences lie, meaning it does not tell us what are the distinguishing nutrients and their distributions among site-types.

D. CONCLUSIONS

One of the aims of this report was to define and characterize the habitats of Cedarvale ravine, so that we as visitors may enter and know its parts. The ravine is much more than a valley of "non-development" between streets of the city. Cedarvale is heterogeneous or patchy ecosystem with several ecological communities within it. Each community is distinguished by the nature of its vegetation (or lack of it) and by other contributing factors such as topography, drainage, and interference by man. Soil characteristics affect vegetation and vegetation determines many important characteristics of soil, including its organic or humic content, and the availability of nutrients like nitrogen or phosphorous. Sometimes nutrient cycling in the soil becomes unbalanced, and nutrients accumulate in or are removed from the ecosystem. An example of accumulation would be in the wetland where organic matter, and, hence, nitrogen have built up due to its poorly drained anaerobic conditions preventing decomposition by micro-organisms. Another example of accumulation is the Under Bathurst Bridge habitat where salt (NaCl) concentrations from Bathurst Bridge reached markedly high amounts. This accounts therefore, for the death of trees, shrubs and grass in this area (see Sec.11.A).

It has been observed, through the grouping of like sites into site-types, that the mixed and maple woods, plus the north-facing and south-facing oak woods comprise a soil type distinctly different from the disturbed bottomland habitats.

These differ in significant ways from the West Swamp, and from the Field, which can be looked at as site-types unto themselves. Of importance to note is that the more obviously disturbed areas (including the Bottomland, Plant-pits, and the Under Bathurst habitats) were quite unlike any of the other natural habitats sampled, as shown by nutrient analysis.

One of the most consistent effects of disturbance on the structure of a biological community is to reduce the total number of species, while allowing some of the survivors to reach abnormally high levels. But in areas of extreme disturbance, such as Under Bathurst Bridge, even the hardy grasses will not survive.

A more balanced nutrient base is necessary for the support of a hierarchy of many species, and for opportunity for successional change at a reasonable rate. More specifically, the disturbed soils of the Bottomland will impede the ecological recovery of Cedarvale's valley floor vegetation.

Questionnaire

9. QUESTIONNAIRE

The questionnaire was designed to sample opinion in a relatively unbiased manner. The main objectives were to sample opinions concerning ravine use and management, attitudes towards nature and wildlife, and to examine the effect of proximity of respondents' homes to the ravine on their opinions.

A. METHODS

Three neighbourhoods were chosen for the sampling of opinion. Those homes which directly border the ravine, homes across the street from those in the previous sample, and finally, homes in two areas (one north of the ravine, the other south) 3 - 4 blocks from the ravine. These sample areas were designated bordering ravine, across the street from ravine and far from ravine, respectively. All three of these samples were subdivided into north and south of ravine for some analyses.

In the neighbourhoods bordering the ravine and those across the street, sampling of every home was attempted to allow confidence in statistical inference.

Sampling in the far neighbourhoods was done by systematic selection (Warwick and Liniger, 1975). Every fourth house on one side of the selected street was canvassed. Sample size was determined using quota sampling (Warwick and Liniger, 1975). That is, the total sample from the combined far neighbourhoods was to equal the number obtained in each of the other two neighbourhoods (Bordering and X-street). The streets which were canvassed in each area are listed in Appendix Table E.1.

Six different people administered the questionnaires. Methods were standardized based on the experience gained in a pre-test on 30 households surrounding Nordheimer Ravine. This test allowed the revision of questions and evaluation of the best approach to respondents.

Respondents were given two options: one, to fill out the questionnaire at their leisure and have the canvassers retrieve it later, or secondly, to fill out the questionnaire with the help of the canvasser at the time of initial contact. The majority were completed in the former manner.

Attempts were made to include people of all ages and those who had no interest in the ravine. This was done to limit the biases of unequal age distribution and variable interest in the ravine.

The great majority of the questionnaires were administered during the last week in July 1979, and the first two weeks in August 1979.

Following the collection of all questionnaires the results were transferred and keypunched onto computer cards. For the data analysis the SPSS (Statistical Package for the Social Sciences) was used (Nie et al, 1975). The results presented in the report are based on output from the subprograms Crosstabs, t-test and ANOVA (Nie et al, 1975). The subprograms Crosstabs and t-test allow statistical testing of the differences in answers to a question by different groups (i.e. Bordering vs. Far). When the question is a nominal type (i.e. answers are yes, no, maybe etc.) Crosstabs is used and computes percentages for each answer and tests the results with the χ^2 statistic. T-test subprogram is used when the question is an interval type (i.e. How many times did you...?). The subprogram computes the mean, standard deviation and the t statistic, which tests for statistical differences between the groups. When the differences are said to be statistically significant this means that there is less than 5% chance that the populations sampled actually have the same opinion (etc.) on the question.

The subprogram ANOVA was used to do Multiple Classification Analysis of the effect of respondents opinions on their frequency of use of the ravine.

B. RESULTS AND DISCUSSION

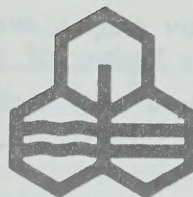
i. General

A total of 234 questionnaires were administered to residents in the neighbourhoods surrounding Cedarvale ravine. The questionnaire was administered in such a way as to distinguish differences among the responses of those who lived adjacent to, across the street from, and several blocks away from Cedarvale ravine. Responses to many of our questions varied with proximity to the ravine. For some questions, responses varied depending on the age group of the respondent.

Before discussing variations in the data due to respondent age and distance from the ravine, we will briefly summarize and discuss the overall results of the questionnaire. Following is a copy of the questionnaire which we administered. The data which we have inserted in the answer blanks are the percentages of all respondents who selected that answer option. Thus the following shows the overall response regardless of respondent age, or distance of home from the ravine.

One of our primary findings is that the ravine is an important part of the neighbourhood. It is very much liked and extensively used. Most people enjoy the natural flora and fauna and take advantage of the open space to stroll, jog, cycle and play in their leisure time. Neighbourhood residents do not want to see any further jamor changes in the ravine. Over $\frac{3}{4}$ of all respondents felt it was important to live near a ravine and even claimed

Institute for Environmental Studies



*University of Toronto
Toronto, Canada
M5S 1A4*

This summer, the Institute for Environmental Studies at the University of Toronto and the Ministry of the Environment are conducting an ecological study of the Cedarvale Ravine. The study will be used to generate conservation and management guidelines for the ravine.

One segment of the study is a public opinion survey. This questionnaire has been designed to determine the value and importance of the ravine to the people who live near it.

We want to know how people use the ravine and how they would like to see it used in the future. We also want to know how familiar people are with the wildlife and natural features of the ravine.

Since a large portion of our final report will be based on the results of this questionnaire, the information which you can provide is essential to our research. We are grateful for your cooperation.

This questionnaire will be left with you.

Our interviewer will pick it up on _____.

1. Have you visited Cedarvale Ravine at least once in the past two years?
Yes 82.9% No 17.1% _____
 2. How important is it to you to live near a ravine?
Very important 45.3% Somewhat important 36.2% Not important 18.5% _____
 3. Are there children in your household who play in the ravine?
Yes 45.9% No 54.1% _____
 4. How important to you was the closeness of the ravine in selecting your present house or apartment?
Very important 38.2% Somewhat important 32.7% Not important 29.1% _____
 5. Did you visit the ravine prior to its excavation for the subway?
Yes 75.0% No 25.0% _____
- Are you satisfied with the way the ravine has been restored?
Very satisfied 58.0% Somewhat dissatisfied 39.0% Very dissatisfied 3.0% _____
- If dissatisfied, please describe why. _____
- _____

6. Since July 1, 1979, how many times (approximately) have you visited the ravine? Average Number of Visits 7.6 + 14.5

Since April 1, 1979, how many times have you visited the ravine?
Average Number of Visits 16.6 + 25.5

- * 7. From the following list, select your THREE most frequent ravine activities. Then, mark the activity for which you use the ravine MOST by writing the number 1 next to it. Mark your SECOND most frequent ravine activity with the number 2. Mark your THIRD most frequent ravine activity with the number 3.

Walking dog	<u>6.9 %</u>	Group sports (soccer, etc.)	<u>3.3 %</u>
Accompanying child	<u>10.9 %</u>	Sunbathing	<u>0.9 %</u>
Walking to or from subway, stores, work	<u>4.7 %</u>	Sitting, reading, relaxing	<u>4.9 %</u>
Strolling, hiking	<u>27.0 %</u>	Nature observation	<u>10.7 %</u>
Jogging	<u>7.8 %</u>	Sketching, painting	<u>0.4 %</u>
Skiing	<u>4.9 %</u>	Photography	<u>1.8 %</u>
Cycling	<u>10.7 %</u>	Gardening	<u>0.0 %</u>
Playing	<u>5.1 %</u>		

Other (describe and indicate frequency) _____

8. What time(s) of day do you usually visit the ravine?

Morning 22.7 % Afternoon 42.0 % Evening 31.8 % Night 3.5 %

9. Do you think it should be illegal to alter ravine slopes by--

Cutting trees	Yes <u>77.3 %</u>	No <u>22.7 %</u>
Thinning underbrush	Yes <u>45.2 %</u>	No <u>54.8 %</u>
Dumping garden refuse	Yes <u>88.2 %</u>	No <u>11.8 %</u>
Dumping trash, building materials	Yes <u>93.1 %</u>	No <u>6.9 %</u>
Filling in or excavating the slopes	Yes <u>75.4 %</u>	No <u>24.6 %</u>

10. Do you think the valley floor should be mowed regularly?

Yes. It should be kept as a lawn. 23.1 %
 Yes, but only in selected areas. 50.0 %
 No. It should be left as a natural field. 26.9 %

11. Should the ravine be lit at night? Yes 76.6 % No 23.4 %

12. What do you feel should be done with the marshy areas of the ravine?

Manage them as habitat for marshland plants and animals. 37.6 %
 Reroute the water in them to form a stream. 32.8 %
 Drain and fill them in. 10.1 %
 Leave them as they are. 19.5 %
 Other _____

13. Dead trees are sometimes used as nesting sites for birds such as flickers.
Do you think dead trees in the ravine should be—
Cut down and removed 18.0 %
Left standing 11.6 %
Cut down only if hazardous to path users 70.4 %
14. Vegetable gardening is becoming increasingly popular in the ravine.
What do you feel should be done about this?
Allow it to expand. 24.6 %
Prohibit it altogether. 27.1 %
Limit it to its present extent. 48.3 %
15. Trees and shrubs have been replanted on the ravine floor.
Do you think these plantings are — Adequate 47.0 % Too sparse 52.9 %
If you wish MORE trees and shrubs, which types would you prefer, e.g., oaks, maples, pines, etc.? Please describe. _____

16. Which sections of the ravine do you MOST enjoy looking at?
Heavily wooded slopes 47.9 % Lawn areas 15.8 %
Open natural field 19.2 % Marsh 6.8 %
Shrubby slopes 8.2 % Other (describe) 2.1 %

Items 17-20 refer to the following list of birds.

- | | | |
|-------------|--------------------|----------------------------|
| 1) Killdeer | 9) Grackle | 17) Nighthawk |
| 2) Blue jay | 10) House wren | 18) Cedar waxwing |
| 3) Flicker | 11) Wood thrush | 19) Mourning dove |
| 4) Catbird | 12) Brown thrasher | 20) Downy woodpecker |
| 5) Cardinal | 13) Chickadee | 21) Crested flycatcher |
| 6) Starling | 14) Song sparrow | 22) Whip-poor-will |
| 7) Oriole | 15) House sparrow | 23) Red-winged blackbird |
| 8) Robin | 16) Chimney swift | 24) Rose-breasted grosbeak |

17. Of the birds listed above, which ones can you recognize ON SIGHT?
List each bird by writing down the number in front of it. _____
Average Number of Bird Species 8.1 + 4.3
18. Of these birds, which ones can you recognize by HEARING their songs only?
List each bird by writing down the number in front of it. _____
Average Number of Bird Species 3.3 + 3.2
19. Which of the above birds have you observed in the RAVINE? _____
Average Number of Bird Species 5.5 + 3.5

20. Which of the above birds have you observed in your NEIGHBORHOOD? _____

Average Number of Bird Species 5.3 ± 3.5

21. Which of the following items do you provide for the birds in your neighborhood?

Feeder 26.0 % Nest box 1.0 % Birdbath 3.4 % None of these 63.0 %

Feeder & Birdbath 6.8 %

22. Do you own dogs or cats? Yes 44.1 % No 55.9 %

23. How many of each? Cats 0.4 $\pm$ 0.8 Dogs 0.3 $\pm$ 0.5

24. Does your pet roam at will in the ravine? Yes 29.2 % No 70.8 %

25. What animals does your pet catch and how often? _____

Birds and/or Rodents was most frequent response

26. If your cat roams, are you willing to bell the cat to warn animals of its presence? Yes 80.9 % No 19.1 %

Items 27-31 refer to the following list of animals.

- | | | |
|---------------------------|-----------|---------------|
| 1) Chipmunk | 6) Bat | 11) Mouse |
| 2) Garter snake | 7) Toad | 12) Mole |
| 3) Red squirrel | 8) Vole | 13) Raccoon |
| 4) Cottontail rabbit | 9) Skunk | 14) Groundhog |
| 5) Black or gray squirrel | 10) Shrew | |

27. Of the animals listed above, which ones do you see in your YARD or on your STREET? List each animal seen by writing the number in front of it.

Average Number of Animal Species 3.8 ± 2.0

28. Which of these animals do you see in the RAVINE? _____

Average Number of Animal Species 3.8 ± 2.8

29. Which of the above animals do you feed? None (72%), Gray Squirrel, Raccoon

30. Which of the above animals do you LIKE having in the ravine? _____

All, Most, Gray Squirrel, Chipmunk, Rabbit are Most Frequent Responses

31. Which, if any, of these animals do you NOT like having in the ravine?

None, Raccoon, Skunk, Bat, Garter Snake are Most Frequent Responses

Why not? _____

32. The ravine floor could be enhanced to attract various bird and mammal species by planting native fruitbearing shrubs, adding nest boxes, etc. Do you think this should be done? Yes 73.8 % No 26.2 %

33. If so, how do you think this should be supported?

Reallocate property tax 12.7 %
Increase property tax 4.9 %
Use lottery proceeds 63.7 %

Private donations 13.7 %
Other 4.9 %

34. Would you participate in organized ravine nature study outings? Yes 51.5 % No 48.5 %

35. How would you like to see the ravine floor used in the future?

Allow it to return to a completely natural state. 27.5 %
Develop it as a surface transportation corridor. 2.4 %
Develop it as completely open parkland with lawns, picnic tables. 8.2 %
Develop a few parkland areas; allow the rest to naturalize. 60.9 %
Other (describe) 1.0 %

36. Mark the age group to which you belong.

Under 13	<u>3.5 %</u>	26-35	<u>19.5 %</u>	Over 60	<u>13.7 %</u>
13-18	<u>9.7 %</u>	36-46	<u>20.8 %</u>		
19-25	<u>13.7 %</u>	47-60	<u>19.0 %</u>		

COMMENTS: _____

THANK YOU FOR TAKING THE TIME TO COMPLETE OUR QUESTIONNAIRE.

it was at least a somewhat important factor in the selection of their present residence.

Some 85% of respondents had visited the ravine in the last two years and during the spring and summer the average frequency of visits per person is about once a week. People generally like to stroll through the ravine often accompanied by family and pets. About half the respondents have children who play in the ravine. People of all ages also find it a convenient and pleasant place to exercise, as many respondents regularly jog and cycle through Cedarvale.

Of course, Cedarvale ravine not only serves as part-time habitat for humans but also as vital breeding habitat for many wildlife species. Many people observe and enjoy the birds, mammals, toads, butterflies, etc. that they see while wandering through the ravine. For many respondents, the most visually pleasing habitats in the ravine are the wooded slopes and the open natural field with its abundance of wild flowers. These are also two of the most important wildlife habitats in the ravine.

Respondents recognized, on average, the same number of species of birds and other animals (about 10) in the ravine as they saw in their own neighbourhood. Most people polled liked all of the mammals and those that did not like them all generally singled out skunks, raccoons or bats as their least favourite. About $\frac{1}{4}$ of residents either had bird feeders or fed the squirrels.

Predation by house pets, especially cats, is known to be a principal mortality factor for birds and small mammals in urban areas (Howard, 1974; Kaiser, Gotfryd et al., 1977). On the basis of our questionnaire results (and other observations: see Sec.5. C.iii.) we feel that Cedarvale is no different in this respect. Nearly $\frac{1}{2}$ of respondents have dogs or cats with cats being slightly more numerous. Many of these roam freely in the ravine, and they primarily catch birds and rodents although reported prey runs the gamut from toads to dragonflies. It is interesting to note that some 80% of cat owners are willing to bell their cats in order to warn prospective prey.

The overall preservationist attitude of Cedarvale neighbourhood residents is reflected in their responses to questionnaire items dealing with ravine management. They generally feel that both the slopes as well as the valley floor should be kept pretty much as is.

Over $\frac{3}{4}$ of respondents think that it should be illegal to cut trees on, excavate, or fill in the ravine slopes. There was almost unanimous support for legislation against dumping garden refuse, trash or building materials on slopes. Some 70% agreed that only those dead trees and limbs which are hazardous to path users should be cut down.

Most respondents favoured a mixture of mown, parklike areas and natural areas for the valley floor. Over $\frac{1}{4}$ felt that the

entire floor should be allowed to naturalize. Very few favoured a completely lawn type approach to the ravine bottomland. Only about 2% supported the idea of Cedarvale being used as a surface transportation corridor.

A considerable majority of those polled had visited Cedarvale prior to subway construction and of these, opinion was quite mixed as to the adequacy of bottomland restoration and planting. About $\frac{3}{4}$ of respondents wanted to deal with the marshy sections of bottomland by either managing them as marsh habitat or by rerouting the water to form a stream. About $\frac{3}{4}$ of respondents felt that the valley floor should be managed to attract wildlife by providing nest boxes and appropriate plantings. The best source of funds for this was considered to be Lottery proceeds.

ii. Neighbourhood Comparisons

In this section, we discuss the variation in the responses to our questionnaire in relation to distance of the respondents' homes to Cedarvale ravine. As expected, things such as frequency of visits, opinions on ravine management and numbers of wildlife species observed on one's property vary with distance from the ravine.

In order to assess the effect of distance on questionnaire responses, the six sampled areas described on page 94 were lumped into three categories based on proximity to the ravine: 1) Near -- including all sampled homes with lots extending into or bordering the ravine; 2) X-street -- those homes across the street from those in the Near sample; and 3) Far -- sampled homes 3-4 blocks away from the ravine. Table 32 on pages 106 to 121 presents the responses to each question by neighbourhood area as described above. In the following discussion, we sequentially characterize each of the three neighbourhood areas in terms of their pattern of response to the questionnaire.

The ravine was, overall, most important to respondents in the Near area. 93% of them said that the ravine was an important factor in choosing their home location. A similar result was found by Wainio et al., (1973) for homes bordering three other City of Toronto ravines. They found that the ravine was important to the home choice of those residents bordering Moore Park Ravine, the Vale of Avoca and Glen Stuart Ravine.

Respondents bordering Cedarvale Ravine usually favoured management options involving the least amount of disturbance to the ravine. One third felt the ravine floor should not be mown at all (Q. 10). Over 80% thought that gardening in the ravine should be at least limited to its present extent (Q. 14). 85% felt that cutting trees on ravine slopes should be illegal. In contrast, only 65% of Far area respondents felt the same way about tree cutting in the ravine.

On other questions, however, Near area respondents seemed less protective of the ravine's "naturalness." Fewer Near respondents favoured making underbrush thinning illegal than in other neighbourhoods (Q. 9b). Presumably this is because they may want to alter their own slopes in this way. Fewer Near respondents favoured managing the ravine to attract more wildlife (68% Near vs. 82% Far). This may be due to Near residents' greater contact with the less positive aspects of increased wildlife (i.e. pest raccoons and squirrels). These responses reflect the vested interest these residents have in certain aspects of ravine management. However, it should be noted that the differences of opinion on ravine management between neighbourhoods are slight. Few of these differences (Q. 9a, 10) are statistically significant (Appendix Table E.2.). Thus, there is general agreement among neighbourhood areas on matters of ravine management.

Not surprisingly, Near respondents used the ravine much more than others. They also engaged in slightly different ravine activities than people from Far neighbourhoods (Q. 7). They jogged, walked their dogs, skied and engaged in nature observation more while they bicycled in the ravine much less.

The differences among neighbourhood areas in awareness of wildlife are more striking. The Near area respondents observed more species of birds (Q. 19,20) and other animals (Q. 27,28) than did those in both X-street and Far samples. This is true for species seen in the ravine as well as those observed near their homes. (Differences are significant, see Appendix Table E.2.). Near respondents also provided more feeders for birds during the winter (Q. 21). Thus, living adjacent to the ravine has an important effect on a person's awareness and appreciation of wildlife.

The Far neighbourhood responses differed significantly from those in the Near area in several respects. In general, Far area responses were relatively less favourable to retention of the natural character of the ravine. The vast majority, however, were opposed to expressway extension (Q. 35) and supported laws protecting the ravine slopes (Q. 9).

One third of the Far respondents had not visited the ravine in the last two years, vs. 9% in the Near area (Q. 1). They visited the ravine less than half as many times during spring and summer of 1979 than those people bordering the ravine (Q. 6). Their main activities in the ravine (Q. 7) were different than those of people who live near the ravine, as noted earlier.

A slight majority of Far area respondents said that it was at least somewhat important for them to live near the ravine. One third of them said that the ravine was unimportant to them. In addition, 57% said that the ravine was not a factor in their choice of home (vs. 7% in the Near area).

Opinions on ravine management also varied somewhat between Far and Near areas. One third of the Far respondents thought cutting trees on ravine slopes should be allowed, in contrast with only 15% surprisingly being of this opinion in the Near sample (Q. 9a). Almost one third thought the valley floor should be mowed regularly, whereas 13% felt this way in the Near area (Q. 10). Other differences of opinion (Q. 13,14): almost $\frac{3}{4}$ thought dead trees should be cut down (vs. 17% Near) and 28% felt that the squatters' gardening area should be allowed to expand (vs. 19% Near). These differences, however, are not statistically significant (t -test, $P > .05$; see Appendix Table E.2.). That is, these differences could have arisen by chance.

The opinions of persons living across the street (X-street) from the ravine were often similar to those in Far neighbourhoods while at other times more like those of residents bordering the ravine.

The importance of the ravine to them personally and to their home choice was intermediate, in these respondents. 92% thought the ravine was at least somewhat important to them personally and 85% admitted its importance in their choice of home. However, slightly less than $\frac{1}{2}$ felt it was very important in these respects (Q. 2,4).

Ravine usage by these people was much greater than respondents far from the ravine. However, their ravine use was somewhat less than that of those respondents living on the edge of the ravine (Q. 1,6,7). Thus, it appears that physical proximity is a major factor controlling frequency of ravine use.

On none of the questions concerning ravine management did these residents' answers differ significantly from those of the other two sampled groups (see Table E.2.). As mentioned earlier, there is general agreement among sampled areas on most management questions.

Wildlife awareness among X-street respondents is much lower than that of those living on the ravine and virtually the same as those far away. The mean number of bird species seen in the ravine by these residents was slightly lower than the number observed by people in the Near area. The means for the X-street sample in questions 17, 20, and 28 were either slightly less or slightly more than those for the Far area. These questions asked how many birds the respondent could identify, how many bird species he/she saw in their neighbourhood and how many other animals he/she observed in the ravine. The mean number of other animals seen in the person's yard (Q. 27) was significantly different from both other samples. They saw more animals than those in the Far area and fewer than those in the Near area. This change from the trend evident from questions 17, 20, and 28 may be a result of several factors. Raccoons, squirrels and skunks often force these homeowners to notice their presence. Also, their greater frequency of dog ownership (Q. 23) could increase their awareness of mammals which their dogs may pursue.

Thus, there appears to be a decrease in wildlife awareness as home distance from the ravine increases. The greatest difference in awareness is from either the Far or X-street samples to the Near homes bordering the ravine.

Question: Have you visited Cedarvale Ravine at least once in the past two years?

NEIGHBOURHOOD	ANSWER		Number of Responses
	YES	NO	
Bordering Ravine	98.7	1.3	78
Across the Street from Ravine	92.1	7.9	63
Far from Ravine	63.4	36.6	93

Question(2): How important is it to you to live near a ravine?

NEIGHBOURHOOD	ANSWER			Number of Responses
	Very Important	Somewhat Important	Not Important	
Bordering Ravine	73.1	20.5	6.4	78
Across the Street from Ravine	46.0	46.0	7.9	63
Far from Ravine	20.9	42.9	36.3	91

Question(3): Are there children in your household who play in the ravine?

NEIGHBOURHOOD	ANSWER		Number of Responses
	YES	NO	
Bordering Ravine	58.4	41.6	77
Across the Street from Ravine	42.9	57.1	59
Far from Ravine	37.6	62.4	93

Question(4): How important to you was the closeness of the ravine in the selecting your present house or apartment?

NEIGHBOURHOOD	ANSWER			Number of Responses
	Very Important	Somewhat Important	Not Important	
Bordering Ravine	63.5	29.7	6.8	74
Across the Street from Ravine	40.7	44.1	15.3	59
Far from Ravine	15.6	27.8	56.7	90

Question(5a): Did you visit the ravine prior to its excavation for the subway?

NEIGHBOURHOOD	ANSWER		Number of Responses
	YES	NO	
Bordering Ravine	84.2	15.8	76
Across the Street From Ravine	76.2	23.8	63
Far from Ravine	66.2	33.8	92

Question(5b): Are you satisfied with the way the ravine has been restored?

Neighbourhood	Answer			Number of Responses
	Very Satisfied	Somewhat Dissatisfied	Very Dissatisfied	
Bordering Ravine	62.2	37.8	0.0	74
Across the Street From Ravine	61.7	35.0	3.3	60
Far from Ravine	50.7	43.7	5.6	71

Question(6a): Since July 1, 1979, how many times have you visited the ravine?

NEIGHBOURHOOD	Number of Visits (Mean $\pm$ S.D.)	Number of Responses
Bordering Ravine	11.7 $\pm$ 16.9	66
Across Street from Ravine	6.4 $\pm$ 17.2	54
Far from Ravine	5.3 $\pm$ 15.3	25

Question(6b): Since April 1, 1979, how many times have you visited the ravine?

NEIGHBOURHOOD	Number of Visits (Mean $\pm$ S.D.)	Number of Responses
Bordering Ravine	24.5 $\pm$ 32.4	66
Across the Street From Ravine	17.5 $\pm$ 22.2	56
Far From Ravine	9.6 $\pm$ 22.2	22

Question(7a): Your most frequent ravine activity (of the given choices).

NEIGHBOURHOOD	Walking Dog	Accompany- ing Child	Walking to or from Store etc	Strolling Hiking	Jogging	Skiing
Bordering Ravine	10.4	13.4	4.5	40.3	10.4	1.5
Across the Street From Ravine	20.0	16.0	10.0	28.0	10.0	2.0
Far From Ravine	5.6	18.5	0.0	35.2	5.6	1.9

Question(7a continued)

NEIGHBOURHOOD	Cycling	Playing	Group Sports	Sun-bathing	Sitting, Nature relaxing	Nature Observ.	Sketch, Paint	Photography
Bordering Ravine	3.0	3.0	3.0	1.5	1.5	6.0	0.0	1.5
Across the Street From Ravine	4.0	0.0	6.0	0.0	0.0	4.0	0.0	0.0
Far From Ravine	20.4	1.9	3.7	0.0	3.7	1.9	1.9	0.0

Question(7b): Your second most frequent activity (of the given choices).

NEIGHBOURHOOD	Walking Dog	Accompanying Child	Walking to or from store etc	Strolling, Jogging Hiking	Skiing
Bordering Ravine	3.4	10.2	3.4	20.3	8.5
Across the Street From Ravine	4.7	14.0	11.6	25.6	2.3
Far From Ravine	2.1	14.6	4.2	31.3	2.1

NEIGHBOURHOOD	Cycling	Playing	Group Sports	Sun-bathing	Sitting, Nature Relaxing	Nature Observ.	Sketch, Paint	Photography
Bordering Ravine	15.3	6.8	5.1	0.0	5.1	13.6	0.0	0.0
Across the Street From Ravine	14.0	2.3	2.3	0.0	2.3	7.0	0.0	0.0
Far From Ravine	14.6	8.3	2.1	2.1	8.3	4.2	0.0	2.1

Question(7c): Your third most frequent ravine activity (of the given choices).

NEIGHBOURHOOD	Walking Dog	Accompanying Child	Walking to or from store etc	Strolling, Jogging Hiking	Skiing
Bordering Ravine	4.0	2.0	2.0	12.0	14.0
Across the Street From Ravine	2.7	2.7	21.6	21.6	8.1
Far From Ravine	7.1	2.4	4.8	23.8	4.8

Question(7c): continued

NEIGHBOURHOOD	Cycling	Playing	Group Sports	Sun- bathing	Sitting, relaxing	Nature Observ.	Sketch, paint	Photo- graphy
Bordering Ravine	10.0	4.0	6.0	0.0	10.0	28.0	0.0	4.0
Across Street From Ravine	8.1	10.8	0.0	2.7	13.5	16.2	2.7	2.7
Far From Ravine	7.1	11.9	0.0	2.4	2.4	19.0	0.0	7.1

NEIGHBOURHOOD	Responses for 1st activity	Responses for 2nd activity	Responses for 3rd activity
Bordering Ravine	67	59	50
Across the Street From Ravine	50	43	37
Far From Ravine	54	48	42

Question(8): What time(s) of day do you usually visit the ravine?

NEIGHBOURHOOD	ANSWER					Number of Responses
	Morning	Afternoon	Evening	Night	All Times	
Bordering Ravine	42.1	30.0	23.6	3.6	0.7	70
Across the Street From Ravine	49.0	30.8	18.3	1.9	0.0	52
Far From Ravine	45.8	27.6	24.2	1.6	0.8	60

Question(9a): Do you think it should be illegal to alter ravine slopes by cutting trees?

NEIGHBOURHOOD	ANSWER		Number of Responses
	Yes	No	
Bordering Ravine	86.8	13.2	68
Across the Street From Ravine	82.4	17.6	51
Far From Ravine	65.3	34.7	75

Question(9b): Do you think it should be illegal to alter ravine slopes by thinning underbrush?

NEIGHBOURHOOD	ANSWER		Number of Responses
	Yes	No	
Bordering Ravine	38.5	61.5	65
Across the Street From Ravine	54.0	46.0	50
Far From Ravine	44.4	55.6	72

Question(9c): Do you think it should be illegal to alter ravine slopes by dumping garden refuse?

NEIGHBOURHOOD	ANSWER		Number of Responses
	Yes	No	
Bordering Ravine	88.0	12.0	75
Across the Street From Ravine	89.1	10.9	55
Far From Ravine	89.0	11.0	82

Question(9d): Do you think it should be illegal to alter ravine slopes by dumping trash, building materials?

NEIGHBOURHOOD	ANSWER		Number of Responses
	Yes	No	
Bordering Ravine	96.1	3.9	76
Across the Street From Ravine	91.2	8.8	57
Far From Ravine	92.8	7.2	83

Question(9e): Do you think it should be illegal to alter ravine slopes by filling in or excavating the slopes?

NEIGHBOURHOOD	ANSWER		Number of Responses
	Yes	No	
Bordering Ravine	75.4	24.6	69
Across the Street From Ravine	79.2	20.8	53
Far From Ravine	72.2	27.8	72

Question(10): Do you think the valley floor should be mowed regularly?

NEIGHBOURHOOD	ANSWER			Number of Responses
	Yes. It should be kept as a lawn.	Yes, but only in selected areas	No. It should be left as a natural field	
Bordering Ravine	13.3	50.7	36.0	75
Across the Street from Ravine	24.1	55.2	20.7	58
Far From Ravine	31.3	47.0	21.7	83

Question(11): Should the ravine be lit at night?

NEIGHBOURHOOD	ANSWER		Number of Responses
	Yes	No	
Bordering Ravine	74.7	25.3	75
Across the Street from Ravine	71.9	28.1	57
Far From Ravine	80.8	19.2	86

Question(12): What do you feel should be do with the marshy areas of the ravine?

ANSWER

NEIGHBOURHOOD	Manage them as habitat for marshland plants and animals.	Reroute the water in them to form a stream.	Drain and fill them in.	Leave them as they are.	Number of Responses
Bordering Ravine	36.4	34.8	7.6	21.2	66
Across the Street from Ravine	46.0	34.0	8.0	12.0	50
Far from Ravine	34.2	30.1	13.3	21.9	73

Question(13): Dead trees are sometimes used as nesting sites for birds such as flickers. Do you think dead trees in the ravine should be--

ANSWER

NEIGHBOURHOOD	Cut down & removed.	Left standing	Cut down only if hazardous to path users.	Number of Responses
Bordering Ravine	17.6	10.8	71.6	74
Across the Street from Ravine	12.1	13.8	74.1	58
Far From Ravine	23.4	9.5	66.7	84

Question(14): Vegetable gardening is becoming increasingly popular in the ravine. What do you feel should be done about this?

ANSWER

NEIGHBOURHOOD	Allow it to expand	Prohibit it altogether	Limit it to its present extent	Number of Responses
Bordering Ravine	18.7	29.3	52.0	75
Across the Street from Ravine	29.6	22.2	48.1	54
Far From Ravine	28.2	28.2	43.6	78

Question(15): Trees and shrubs have been replanted on the ravine floor.
Do you think these plantings are --

NEIGHBOURHOOD	ANSWER		Number of Responses
	Adequate	Too Sparse	
Bordering Ravine	50.0	50.0	68
Across the Street from Ravine	42.3	57.7	52
Far From Ravine	48.4	51.6	64

Question(16): Which sections of the ravine do you most enjoy looking at?

NEIGHBOURHOOD	ANSWER							Number of responses
	Heavily wooded slopes	Open natural field	Shrubby slopes	Lawn areas	Marsh	All areas	Other	
Bordering Ravine	52.2	15.6	6.7	7.8	4.4	10.0	3.3	72
Across the Street From Ravine	41.8	20.8	7.5	22.4	3.0	3.0	1.5	49
Far From Ravine	38.1	17.6	8.2	15.5	10.3	9.3	1.0	72

Question(17): Of the birds listed, which ones can you recognize ON SIGHT?

NEIGHBOURHOOD	Number of Bird Species (Mean $\pm$ S.D.)	Number of Responses
Bordering Ravine	9.52 $\pm$ 4.71	73
Across the Street from Ravine	7.23 $\pm$ 4.10	52
Far From Ravine	7.42 $\pm$ 3.64	76

Question(18): Of the birds listed, which ones can you recognize by HEARING their songs only?

NEIGHBOURHOOD	Number of Bird Species (Mean $\pm$ S.D.)	Number of Responses
Bordering Ravine	3.75 $\pm$ 3.24	65
Across the Street from Ravine	2.82 $\pm$ 3.25	39
Far From Ravine	3.16 $\pm$ 3.10	55

Question(19): Which of the above birds have you observed in the ravine?

NEIGHBOURHOOD	Number of Bird Species (Mean $\pm$ S.D.)	Number of Responses
Bordering Ravine	6.71 $\pm$ 3.78	62
Across the Street from Ravine	4.36 $\pm$ 2.90	36
Far From Ravine	4.71 $\pm$ 2.94	38

Question(20): Which of these birds have you observed in your neighbourhood?

NEIGHBOURHOOD	Number of Bird Species (Mean $\pm$ S.D.)	Number of Responses
Bordering Ravine	6.25 $\pm$ 3.88	62
Across the Street from Ravine	5.29 $\pm$ 2.63	42
Far From Ravine	4.57 $\pm$ 2.38	68

Question(21): Which of the following items do you provide for the birds in your neighbourhood?

ANSWER

NEIGHBOURHOOD	Feeder	Nest Box	Birdbath	Birdbath & Feeder	None of these	Number of Responses
Bordering Ravine	35.6	0.0	2.7	8.2	53.4	73
Across the Street from Ravine	20.4	0.0	3.7	7.4	68.5	54
Far From Ravine	21.0	2.5	4.9	3.7	67.9	81

Question(22): Do you own dogs or cats?

ANSWER

NEIGHBOURHOOD	Yes	No	Number of Responses
Bordering Ravine	53.2	46.8	77
Across the Street from Ravine	48.3	51.7	58
Far From Ravine	33.0	67.0	88

Question(23): How many of each?

NEIGHBOURHOOD	Number of Cats (Mean $\pm$ S.D.)	Number of Dogs (Mean $\pm$ S.D.)	Number of Responses
Bordering Ravine	.399 $\pm$.728	.338 $\pm$.553	77
Across the Street from Ravine	.414 $\pm$.726	.310 $\pm$.537	58
Far From Ravine	.341 $\pm$ 1.00	.159 $\pm$.398	88

Question(24): Does your pet roam at will in the ravine?

NEIGHBOURHOOD	ANSWER		Number of Responses
	Yes	No	
Bordering Ravine	48.8	51.2	41
Across the Street from Ravine	17.9	82.1	28
Far From Ravine	12.9	87.1	32

Question(25): What animals does your pet catch?

NEIGHBOURHOOD	ANSWER					Number of Responses
	Birds and Rodents	Insects	Toads	Snakes	None	
Bordering Ravine	33.4	3.0	3.0	3.0	57.6	33
Across the Street from Ravine	50.0	0.0	0.0	5.0	45.0	20
Far From Ravine	40.0	0.0	0.0	5.0	55.0	19

Question(26): If your cat roams, are you willing to bell the cat to warn animals?

NEIGHBOURHOOD	ANSWER		Number of Responses
	Yes	No	
Bordering Ravine	84.2	15.8	19
Across the Street from Ravine	76.9	23.1	13
Far From Ravine	80.0	20.0	11

Question(27): Of the animals listed, which ones do you see in your yard or on your street?

NEIGHBOURHOOD	Number of Animal Species (Mean $\pm$ S.D.)	Number of Responses
Bordering Ravine	4.91 $\pm$ 2.15	71
Across the Street from Ravine	3.88 $\pm$ 1.68	59
Far From Ravine	2.77 $\pm$ 1.35	84

Question(28): Which of these animals do you see in the ravine?

NEIGHBOURHOOD	Number of Animal Species (Mean $\pm$ S.D.)	Number of Responses
Bordering Ravine	4.44 $\pm$ 3.32	64
Across the Street from Ravine	3.56 $\pm$ 2.89	48
Far From Ravine	3.17 $\pm$ 1.35	84

Question(29): Which of these animals do you feed?

ANSWER

NEIGHBOURHOOD	None	Chipmunk	Red Squirrel	Gray Squirrel	Raccoon	Rabbit	Number of Responses
Bordering Ravine	69.9	2.7	0.0	12.3	13.7	1.4	63
Across the Street from Ravine	78.1	4.7	1.6	14.0	1.6	0.0	47
Far From Ravine	68.3	5.0	0.0	23.3	3.4	0.0	56

Question(30): Which of these animals do you like having in the ravine?

ANSWER

NEIGHBOURHOOD	All Animals	Most Animals	None	Chipmunk	Garter Snake	Red Squirrel	Gray Squirrel	Rabbit	Toad	Raccoon	Groundhog	Bat	Skunk	No. of Resp.
Bordering Ravine	49.4	12.6	2.3	8.0	4.6	4.6	6.9	3.4	5.7	2.3	0.0	0.0	0.0	60
Across the Street from Ravine	52.9	7.9	15.0	3.9	0.0	1.0	10.1	5.1	1.0	1.0	2.1	0.0	0.0	58
Far From Ravine	56.7	8.2	3.1	5.2	1.0	3.1	4.1	6.2	2.1	6.2	1.0	1.0	2.1	82

Question(31): Which, if any, of these animals do you not like having in the ravine?

ANSWER

NEIGHBOURHOOD	All Animals	None	Toad	Chipmunk	Garter Snake	Red Squirrel	Gray Squirrel	Bat	Skunk	Mouse	Raccoon	Vole	Shrew	Groundhog	Mole	No. of Resp.
Bordering Ravine	0.0	40.2	0.0	0.0	9.9	1.1	1.1	5.4	17.4	5.4	14.1	1.1	2.1	1.1	1.1	67
Across the Street from Ravine	1.3	56.0	0.0	0.0	4.0	0.0	0.0	9.3	8.0	4.0	10.7	0.0	5.4	0.0	1.3	42
Far From Ravine	1.1	31.5	2.2	2.2	6.7	0.0	1.1	15.8	14.6	5.6	12.5	0.0	0.0	4.5	4.5	63

Question(32): The ravine floor could be enhanced to attract various bird and mammal species by planting native fruit-bearing shrubs, adding nest boxes, etc. Do you think this should be done?

NEIGHBOURHOOD	ANSWER		Number of Responses
	Yes	No	
Bordering Ravine	68.1	31.9	69
Across the Street from Ravine	67.9	32.1	53
Far From Ravine	81.9	18.1	83

Question(33): If so (yes to Q.32), how do you think this should be supported?

NEIGHBOURHOOD	ANSWER					Number of Responses
	Reallocate Property Tax	Increase Property Tax	Use Lottery Proceeds	Private Donations	Other	
Bordering Ravine	18.8	0.0	62.5	9.4	9.4	32
Across the Street from Ravine	11.1	7.4	66.7	14.8	0.0	27
Far From Ravine	9.5	7.1	61.9	16.7	4.8	42

Question(34): Would you participate in organized ravine nature study outings?

NEIGHBOURHOOD	ANSWER		Number of Responses
	Yes	No	
Bordering Ravine	52.2	47.8	69
Across the Street from Ravine	49.1	50.9	53
Far From Ravine	51.9	48.1	77

Question(35): How would you like to see the ravine floor used in the future?

121

ANSWER

NEIGHBOURHOOD	Allow it to return to a completely natural state.	Develop it as a surface transportation corridor.	Develop it as a completely open parkland with lawns, picnic tables	Develop a few parkland areas; allow the rest to naturalize.	Other	No. of Resp.
Bordering Ravine	33.3	0.0	6.7	58.7	1.3	75
Across the Street from Ravine	26.8	1.8	8.9	60.7	1.8	56
Far From Ravine	22.7	5.3	9.3	62.7	0.0	75

Question(36): Which age group do you belong to?

ANSWER

NEIGHBOURHOOD	Under 13	13-18	19-25	26-35	36-46	47-60	Over 60	Number of Responses
Bordering Ravine	4.0	14.7	9.3	16.0	25.3	22.7	8.0	75
Across the Street from Ravine	3.3	8.3	13.3	13.3	23.3	21.7	16.7	60
Far From Ravine	3.3	6.7	17.8	26.7	14.4	14.4	16.7	90

iii. Age Group Comparisons

The questionnaire allowed us to examine differences in opinion among age groups. Three age groups were defined, those 25 years or less, 26 to 46 years, and 47 years or more (Q. 36). The results from questions in which there were significantly different answers (t-test, χ^2 test) are presented in Table 33, on pages 123 to 126.

Younger people used the ravine most with use declining as age increased (Q. 1,6,7). Young people have more free time to visit the ravine and need places to play and discover nature. Changes in lifestyle with age, affect the frequency of ravine visits and the kind of ravine activity engaged in. Young people engaged in more very physical activities such as jogging, cycling, playing and group sports (Q. 7a,b). Older people tended to be involved in more passive activities like strolling, walking their children and observing nature.

There were also differences among the generations in their opinions on the management of Cedarvale and attitudes towards wildlife. A slightly higher proportion of those over 46 (18% vs. 4 and 8%) felt the marshy areas should be drained. Similarly, over 40% thought wildlife should not be attracted to the ravine through a planned program (Q. 32). Older people tended to express more negative comments about certain wildlife components in the ravine (i.e. skunks and raccoons). They also tended to be less aware of the presence of mammals, reptiles and amphibians both in their neighbourhoods and in the ravine (Q. 27,28) than young people.

Older people, however, were much more aware of birds. They could identify more species by both song and sight (Q. 17,18). In the ravine and in their neighbourhood, older people saw more bird species (Q. 19,20), and many derive great pleasure from birds.

Two other questions were answered differently by the various age groups. Far fewer people under 25 felt cutting trees in ravines should be illegal (62% vs. 80 and 85%).

Most of those respondents between 26 and 46 (68% felt the replanting of the bottomland was inadequate (Q. 15). This differs from both other age groups (i.e. <26, >46) among whom a majority approved of the job.

Question(1): Have you visited Cedarvale Ravine at least once in the past two years?

AGE GROUP	ANSWER		Number of Responses
	Yes	No	
25 or less	86.9	13.1	61
26 to 46	89.5	10.5	91
47 or more	70.3	29.7	74

Question(6): Since July 1, 1979, how many times have you visited the ravine?

AGE GROUP	Number of Visits (Mean $\pm$ S.D.)	Number of Responses
25 or less	12.3 $\pm$ 21.3	55
26 to 46	6.8 $\pm$ 10.1	82
47 or more	4.9 $\pm$ 13.0	65

Question(7): Since April 1, 1979, how many times have you visited the ravine?

AGE GROUP	Number of Visits (Mean $\pm$ S.D.)	Number of Responses
25 or less	23.3 $\pm$ 31.9	54
26 to 46	16.5 $\pm$ 25.5	80
47 or more	8.6 $\pm$ 15.2	65

Question(7a): What is your FIRST most frequent ravine activity?

ANSWER

AGE GROUP	Walk Dog	Accompany child	Walk to store etc.	Stroll	Jog	Ski	Cycle	Play	Group Sports	Sit, bath	Relax	Nature Sketch, etc.	Photo- graphy
25 or less	14.9	0.0	.6.4	21.3	14.9	2.1	12.8	6.4	8.5	2.1	6.4	2.1	0.0
26 to 46	11.5	29.5	1.3	34.6	5.1	2.6	9.0	0.0	2.6	0.0	0.0	2.6	1.3
47 or more	9.5	9.5	9.5	54.8	7.1	0.0	0.0	0.0	0.0	0.0	0.0	9.5	0.0

Question(7b): What is your SECOND most frequent ravine activity?

ANSWER

AGE GROUP	Walk Dog	Accompany child	Walk to store etc.	Stroll	Jog	Ski	Cycle	Play	Group Sports	Sit, bath	relax	Nature Sketch, etc.	Photo- graphy
25 or less	0.0	2.3	2.3	27.9	16.3	0.0	23.3	14.0	7.0	2.3	4.7	0.0	0.0
26 to 46	2.7	16.4	9.6	28.8	6.8	4.1	15.1	2.7	1.4	0.0	5.5	5.5	1.4
47 or more	6.7	20.0	3.3	16.7	3.3	13.3	3.3	0.0	3.3	0.0	3.3	26.7	0.0

Question(9a): Do you think it should be illegal to alter ravine slopes by cutting trees?

AGE GROUP	ANSWER		Number of Responses
	Yes	No	
25 or less	61.8	38.2	55
26 to 46	85.5	14.5	83
47 or more	80.0	20.0	50

Question(12): What do you feel should be done with the marshy areas of the ravine?

AGE GROUP	ANSWER				Number of Responses
	Manage for plants and animals	Reroute the water to form a stream	Drain them and fill them in	Leave them as they are	
25 or less	38.5	32.7	3.8	25.0	52
26 to 46	46.0	36.8	7.9	9.2	76
47 or more	26.8	28.6	17.9	26.8	56

Question(15): Trees and shrubs have been replanted on the ravine floor. Do you think these plantings are --

AGE GROUP	ANSWER		Number of Responses
	Adequate	Too sparse	
25 or less	64.9	35.2	54
26 to 46	32.5	67.5	77
47 or more	54.2	45.8	48

Question(17): Of the birds listed, which ones can you recognize ON SIGHT?

Question(18): Of these birds, which ones can you recognize by HEARING their songs?

Question(19): Which of these birds have you observed in the RAVINE?

Question(20): Which of these birds have you observed in your NEIGHBOURHOOD?

AGE GROUP	Number of species recognized on sight	Number of species recognized by hearing	Number of species seen in ravine	Number of species seen in neighbourhood
25 or less	6.4 $\pm$ 3.3	1.8 $\pm$ 1.9	5.0 $\pm$ 3.7	3.9 $\pm$ 2.4
26 to 46	8.6 $\pm$ 4.2	3.7 $\pm$ 3.1	5.5 $\pm$ 3.2	5.6 $\pm$ 2.7
47 or more	8.8 $\pm$ 4.8	3.8 $\pm$ 3.5	6.1 $\pm$ 3.6	6.2 $\pm$ 3.7

Question(27): Of the animals listed, which ones do you see in your YARD or on your STREET?

Question(28): Which of these animals do you see in the ravine?

AGE GROUP	Number of species observed in yard or on street	Number of species observed in ravine	Number of Responses to Q.27	Number of Responses to Q.28
25 or less	4.5 $\pm$ 2.4	5.1 $\pm$ 3.4	56	49
26 to 46	3.6 $\pm$ 1.7	3.2 $\pm$ 2.6	85	74
47 or more	3.4 $\pm$ 1.8	3.6 $\pm$ 2.6	72	40

Question(32): The ravine floor could be enhanced to attract various bird and mammal species by planting native fruitbearing shrubs, adding nest boxes, etc. Do you think this should be done?

AGE GROUP	ANSWER		Number of Responses
	Yes	No	
25 or less	75.9	24.1	54
26 to 46	85.5	14.5	83
47 or more	58.5	41.5	65

iv. Respondents' Comments

The residents of the Cedarvale area had many of their own ideas concerning the ravine and its use. We provided space for respondents to write down these ideas at the end of the questionnaire. Well over one third took advantage of this and wrote from two words to two pages.

People of all ages commented, from a 6 year old writing about catching tadpoles to a 70 year old reminiscing about the former swimming holes in Cedarvale.

In this section, we summarize these comments, noting the most frequent and quoting some of the most interesting.

Comments were very diverse, covering the whole gamut of issues and concerns. By far, the most frequently raised issue was that of ravine preservation. The overwhelming majority of comments favoured protection of Cedarvale from development. Some demanded action not words, others were cynical, feeling the destruction of Cedarvale was inevitable, but all liked Cedarvale as it is.

Many felt the ravines are 'Toronto's most cherished natural treasures'. One person said "Once these areas are developed for other purposes they can never be replaced." Another thought that "we need all the natural places we can get." One person recently moving to Toronto "was incredibly impressed by this city's green spaces and most especially by the wonderful ravine (Cedarvale) -- just ten minutes from downtown."

Many people derived psychological benefit from using the ravine. A lady over 60 said: "I forget my troubles and enjoy the peace and quiet. It's like taking a short holiday, and coming home with a good feeling. That makes my day." Many commented on the joy of having a quiet place to walk and feeling like they are in the countryside while using the ravine. One respondent said he likes to jog in the ravine and "pretend that I am in the woods."

The decline of wildlife through time and especially during the construction of the subway was noted by many residents. One couple whose backyard now overlooks an apartment building remember pheasants, rabbits and other wildlife visiting their yard years ago. Numerous people commented on the decline of squirrels, raccoons, and birds during subway construction. One resident was sure that raccoons invaded his garage as a result of this construction!

Another aspect of nature which ravine users have enjoyed is wild berry picking. One respondent had done this in the 1940s and 1950s. The authors of this report also enjoyed picking raspberries and blackberries during the summer of 1979.

Respondents often commented on general ravine management policies. While the vast majority favoured the natural character of the ravine, a few respondents stated that they wanted the Allen Expressway extended south. Most of these lived in the South-Far neighbourhood (see page 94).

Feelings were mixed on the subway construction. Despite objections to its negative effect on the ravine, people also felt the subway was necessary. Restoration of the ravine floor was often attacked. Several people noted that the planted trees and shrubs were too widely spread and great numbers of them were dead or dying.

Many changes were suggested to alter the present state of the ravine.

Several people wanted more facilities in the ravine. Common suggested additions were: A swimming pool in the park; park benches and washrooms. Others objected to such changes, feeling that they would alter the character of the ravine.

Some felt that more supervision of the ravine should be provided. This included more frequent police patrol, a by-law to require leashes on dogs, and enforcement of laws prohibiting motorcycles and cars.

Other suggestions included the creation of a walking path to connect Cedarvale and Nordheimer ravines, removal of the abundant garbage and cleanup of the polluted portion of the stream near the Glencedar footbridge.

Children are the most frequent and important ravine users. Parents and grandparents over and over stressed the ravine's significance to their children and grandchildren now, in the past, and hopefully, in the future.

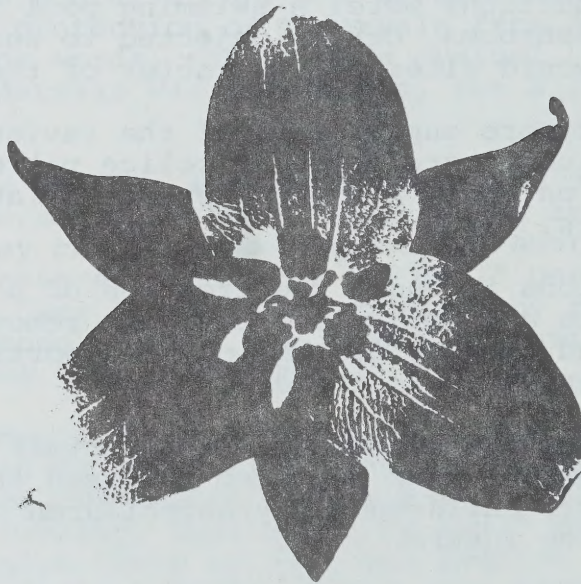
Several seniors reminisced about their children doing much of their growing up in the ravine. They skated, swam, discovered nature, picniced, relaxed and bicycled in the ravine.

One felt that because the Borough of York has a lack of parkland, Cedarvale is essential to the residents, especially to the children.

The comments by children support those of their parents. It is evident that many children spend a good portion of their summer vacation in the ravine. An example of how much they use the ravine and how many of them feel about it comes from a young girl named Shannon.

"I live near Cedarvale Ravine. I have ever since I turned six. I love the area more than any other park around here or anywhere else. It's gorgeous! Please keep it the way it is.

It's so beautiful because it's like a forest! It's so natural and pleasant. I go there even if it's raining. I love it there. Most of the time I go with friends, and play some kind of game (baseball etc.) or have picnics. Or I go jogging there or I collect toads and tadpoles with my sister. I do so many things there so often! Please, don't ever change the ravine."



Human Use

10. HUMAN USE

- To find out:
- 1) How many people use the ravine
 - 2) In what activities users are engaged
 - 3) How old the users are
 - 4) How user density varies with time of day
 - 5) Where within the ravine activity is concentrated

Observations of human use were made continuously throughout the day on Saturday, July 28, 1979. Using two shifts of observers at each of three locations, we observed people from dawn until dusk in virtually all parts of Cedarvale ravine. For each person, we recorded age, activity and clothing description.

Age was recorded in four categories -- child, teen, adult, and senior. Activities recorded included walking, jogging, cycling and playing. Observers also took note of people walking dogs, bird watching, collecting vegetation, etc. Clothing descriptions were recorded to aid in eliminating duplicate observations. Observations were interrupted for about 20 minutes at 5:00 p.m. when it started raining heavily.

Users were categorized into four age classes and three main activities. The results are summarized in the following Table.

	walk	jog	cycle	(total)	
	16	4	57	77	child
	15	3	21	39	teen
	70	52	19	141	adult
	6	0	2	8	senior
(total)	107	59	99	265	N

Table 34. Activity and age of ravine users.

From the above data, we see that at least 265 people used the ravine on July 28. Considering the haziness of the day, the periodic drizzle, and the afternoon storm, human use of Cedarvale ravine is clearly quite intense. Most users were adults with children being the next largest group.

Different age groups tended to engage in different activities. For instance, over a third of the adults jogged through the ravine

while other age groups rarely jogged. Cycling, on the other hand, was the primary activity of children and decreased in frequency with increasing user age.

Over all, about $\frac{2}{5}$ of users cycled, another $\frac{2}{5}$ walked and the remainder jogged. Many users were accompanying dogs (30) and about 10 were collecting vegetation (cattail, chicory, dead branches, saplings). A few families have planted vegetable gardens and were tending these. The great bulk of activity was confined to the path and the immediately adjacent grass.

In addition to the age-activity analysis, we also have hourly data on the numbers of people in the ravine. This information is presented in the following histogram (Figure 10). The x axis represents time of day and the y axis is the percentage of the full day's users visiting in a given hour.

Visitors increased in number throughout the morning but visits dropped off markedly at lunch time. Afternoon use was intense until rain blew in at 5:00 p.m. for about 20 minutes. After the rain, people were most abundant, and the highest values of hourly use were recorded in the two hours before dusk.

Figure 10. Hourly ravine use for July 28, 1979, expressed as per cent of total number of users for the day.



MANAGEMENT

11. MANAGEMENT

A. CHANGING LAND CHANGING HANDS

At the time of writing, scores of property owners and at least five public agencies are directly involved in the fate of Cedarvale ravine. Furthermore, each home owner and each corporate body has its own perspective and its own impact on the ravine. In this respect, Cedarvale is not unique among urban natural areas. Like Cedarvale, many Toronto ravines are criss-crossed with lot lines, are under a variety of jurisdictions, and have a variety of services running through them with, of course, a variety of corporations installing and maintaining these.

The historical context illustrates how this state of affairs arose. The steep slopes and bottomland floodplains made ravines very difficult sites for urban development. Thus, except for the 19th century logging, Toronto ravines have enjoyed relative freedom from the hand of man, until recent decades.

The increasing human density and physical size of Toronto put a great demand on existing services. People needed storm drainage, electricity, gas, and passenger and freight transportation. What more appropriate corridor for such services than a ravine? There were no homes or businesses to displace, the land was cheap and unused, and the service needs were very great.

The only significant argument against using the ravine as a service corridor or highway is that the ravine may be more valuable as a natural area. This contention is not merely the view of elderly bird-watchers and "groovy eco-freaks". Psychologists know the importance of open space to the mental health of crowded urbanites. So do the thousands of ravine visitors. And so do some land-use decision makers.

As early as 1909 and up until 1942, various civic agencies, including the City of Toronto Planning Board, overwhelmingly supported the preservation of the natural condition of our ravines. Although post-war planning reports still voiced the value of natural parkland, ravines were concurrently viewed as the best location for major traffic routes (The Ravine Developers, 1972). That these two approaches to ravine management are incompatible is obvious. How many people do you know who have gone for a walk in the Don Valley since the construction of the Parkway?

As expressway fever peaked in the 1950s and 1960s, plans to run a highway into downtown Toronto via Cedarvale ravine were put into action. The Allen Expressway was built from Highway 401 to Eglinton Avenue but determined public resistance halted its continuation into Cedarvale. Lobbying by local ratepayers and the Ravine

Developers Group (1972 publication -- see Reference Sec.) was instrumental in prompting Premier Davis' 1971 promise that the expressway would go no further. Since that time, the issue of the expressway has been sleeping fitfully, but we shall return to this topic in the next section.

Considerable preparations had been made for the aborted expressway extension. During the 1960s the Metro Properties Department acquired the great majority of Cedarvale bottomland and some slope sections. The funds for this expropriation came primarily from the provincial Ministry of Transportation and Communication. The expropriated lands included the back lots of the homes along Heathdale Road, Ridgewood Road, Glenayr Road and a large portion of the property north of Heath Street, formerly belonging to St. Michael's College. Figure 11 shows ownership and status of ravine lands.

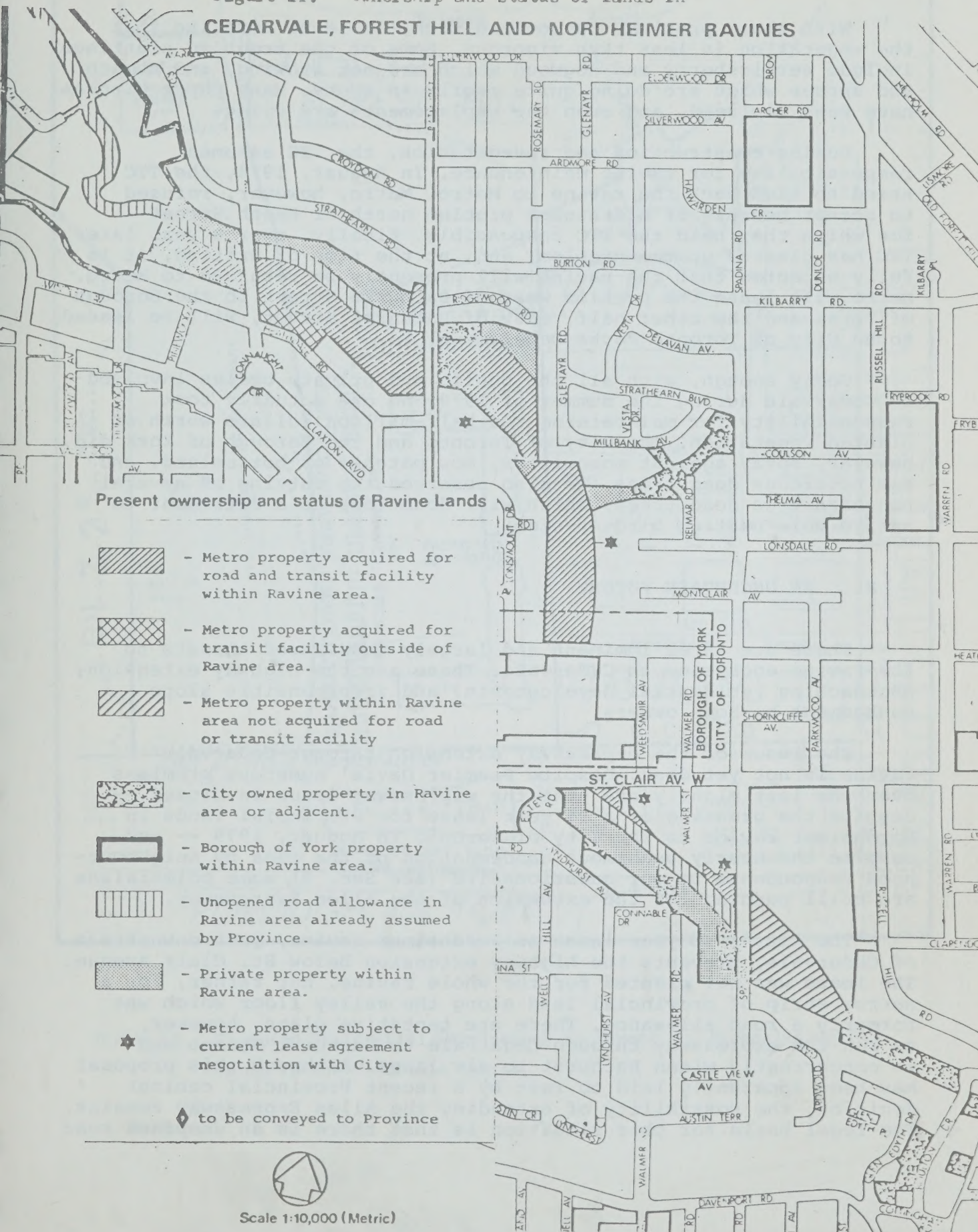
Then, from 1968 to 1970 a major storm sewer was installed in the ravine also in anticipation of the expressway extension. This project virtually eliminated the very habitat for which Cedarvale was named.

With the "end" of the Allen Expressway came plans for a subway extension through Cedarvale, which were eventually approved. The Metro owned bottomland was given or leased to the Toronto Transit Commission (TTC) for the duration of subway construction on the condition that the valley floor be reasonably restored to a natural state. In order to accomplish this, a "cut and cover" construction method was used, and a restoration program was undertaken.

Subway construction began in 1974 and was completed in early 1978. Design and supervision of the revegetation program was contracted out to Johnson, Sustrom, Winstein and Associates. The implementation of their landscape design was carried out by various nurseries under contract with the TTC. The total cost of the grading and revegetation was \$621,046.23 (Brad Johnson -- personal communication).

Although the revegetation program was largely successful, many trees had to be replaced and many others are faring poorly and will likely die. It appears that there are three main reasons for these problems. First, the fill used to cover the subway was largely excavated material and had very poor drainage characteristics (see Soil Sec.). In fact, some tree-pits between Glen Cedar Road and Bathurst Street had standing water for a year before they were drained sufficiently for planting (Neil Melman -- personal communication). Second, TTC did not include a maintenance clause in the planting contracts despite protests by the landscape consultants and by the Borough of York. Thus, although plant material was guaranteed for a year, no pruning, watering, etc. was undertaken. Finally, some plantings were poorly located. For example, several spruce trees were planted under Bathurst Street Bridge where the salty, oily, lead-laden run-off pours down about 100 feet onto the planted trees.

Figure 11. Ownership and status of lands in -
CEDARVALE, FOREST HILL AND NORDHEIMER RAVINES



With these problems to contend with, it is no surprise that the vegetation is less than vigorous. Some of the troubled plantings include serviceberry and dogwood which are not growing, and sumach and spruce which are doing quite poorly in spots. Many paper birches have been replaced, and even the replacements are dying.

During construction and revegetation, the TTC assumed responsibility for ravine maintenance. In August, 1978, the TTC tried to sign back the ravine to Metro. Metro, however, refused to accept because of a drainage problem north of Heath Street for which they held the TTC responsible. Finally, over a year later, TTC has cleared up the problem, and, at the time of writing, it is fully expected that the ravine will presently be returned to Metro. Metro will lease the portion west of Bathurst Street to the Borough of York, and the other half, east of Bathurst Street, will be leased to the City of Toronto Parks Department.

Oddly enough, with all the public and private bodies involved in Cedarvale during the summer of 1979, no one actually took responsibility for maintaining the half-million dollars worth of planted vegetation. The City of Toronto and the Borough of York did, however, spray against mosquitoes, mow patches of bottomland, and cut hazardous dead trees. We also observed the cutting of several non-hazardous dead trees, which will doubtless be a detriment to native hole-nesting bird species.

B. AN UNCERTAIN FUTURE

There are three imminent and largely unassessed threats to the ravine ecosystem in Cedarvale. These are the highway extension, encroaching residential developments, and irresponsible slope management by home owners.

The issue of the expressway extension through Cedarvale ravine is not yet dead. Despite Premier Davis' numerous promises over the last eight years that the expressway issue is closed -- despite the granting of a 99 year lease for Provincial lands in Nordheimer ravine to the City of Toronto in August, 1979 -- and despite the nearly unanimous condemnation of the idea by neighbourhood respondents to our questionnaire (see Sec. 9), some politicians are still pushing for the extension of the Allen Expressway.

The City's 99 year lease on Nordheimer ravine, just downstream of Cedarvale, prevents the highway extension below St. Clair Avenue. The lease was not granted for the whole ravine, but rather, for a narrow strip of provincial land along the valley floor which was formerly a road allowance. There are tentative plans, however, to run the expressway through Cedarvale to Bathurst Street and to concurrently widen Bathurst to six lanes. Although this proposal has been apparently laid to rest by a recent Provincial cabinet decision, the possibility of extending the Allen Expressway remains. The legal basis for this situation is that there is an unopened road

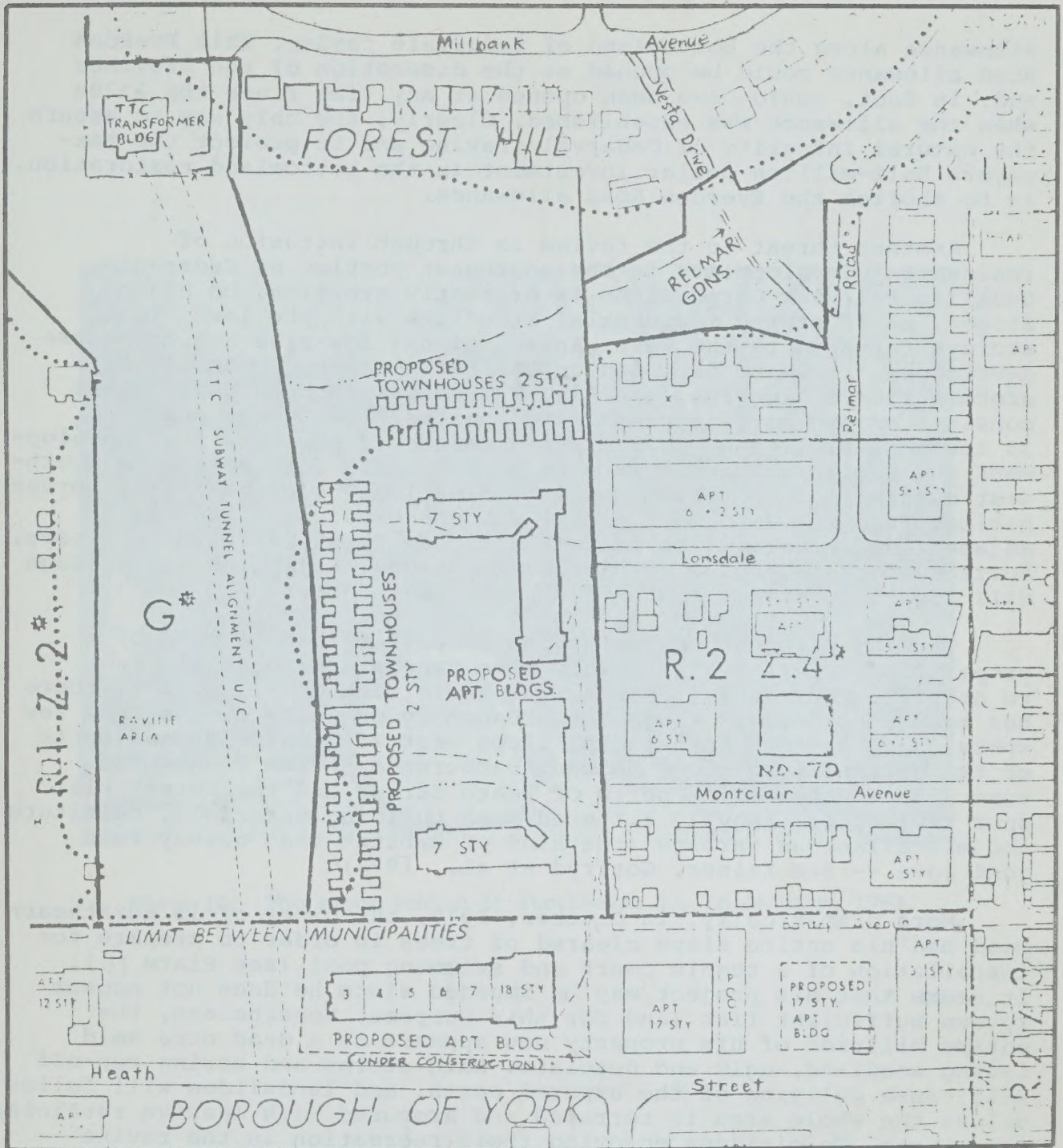


Figure 12. Proposed Residential Development on Former St. Michael's College Lands in the Cedarvale Ravine.

allowance along the bottomland of Cedarvale ravine. This Everden Road allowance could be opened at the discretion of the Province and, in fact, could have been opened at any time since the 1920s when the allowance was established. Clearly, the only way to assure the natural integrity of Cedarvale ravine and to protect the taxpayers half-million dollar investment in the bottomland restoration, is to abolish the Everden Road allowance.

Another threat to the ravine is through intrusion of residential developments in the southeast portion of Cedarvale. Cadillac-Fairview Corporation is presently erecting, on Heath Street, an 18 storey residential structure with the last eight storeys terraced to the west. An additional low-rise and townhouse development is being proposed on the field to the north of the aforementioned highrise (see Fig. 12). This proposed development consists of two large seven-storey apartment buildings and 33 townhouses. If the Ontario Municipal Board approves this development, the ecological and aesthetic consequences for the entire southwest quadrant of the ravine will be drastic. The unique Field border habitat (see Sec.3. and Fig. 15) will be eradicated and the adjacent drainage will be further altered. Sharp increases in shade, horizon blockage, noise, vehicular emissions, trampling and garbage will adversely affect flora, fauna and human users.

The third threat to the ravine ecosystem is by owners of properties bordering the ravine. Home owners are generally keen to preserve the natural splendor of their back lots, However, there has been considerable slope disturbance by property owners in a few spots, such as the south-facing slope west of Glen Cedar and parts of the north-facing slope between Bathurst and Glen Cedar. The west side of the ravine north of Heath Street and the Forest Hill spur ravine, are heavily littered with building materials, furniture and miscellaneous garbage (the kind of habitat that norway rats just love -- see Kaiser, Gotfryd et al., 1977).

More dramatically, in October, 1979, the owner of 15 Strathearn Road had his entire slope cleared of trees in order to prepare for installation of a tennis court and swimming pool (see Plate 10). It seems that his project may be impeded since he does not appear to own sufficient flat land for this purpose. Nonetheless, the entire hillside of his property now appears as a dead area amid living woodland, ugly and desolate. Rain storms and spring run-off will cause gullying of the exposed earth, and landslides will follow -- unless the whole area is terraced and armoured with massive retaining structures. To citizens enjoying their recreation in the ravine below, this gash in the wooded slopes will serve as an object lesson in how not to treat the protective covering of vegetation on a valley hillside.

Legislation proposed both in the City of Toronto and in the Borough of York would forbid such action. Section 1.c. of the Borough of York Act (1975) prohibits:



P. Smith

Plate 10. The slope behind 15 Strathearn Rd. in January, 1980.

"the destruction of such trees or other natural vegetation and the excavating or other altering of contours of any such (officially designated ravine) land without the consent of the Corporation (of the Borough of York)."

The City of Toronto has taken a similar stand. However, the major bottleneck seems to be the official designation of ravines. To our knowledge, only Coldstream ravine (west of Avenue Road and south of Lawrence Avenue) has been officially designated. Our questionnaire results (Sec. 9) illustrate the overwhelming support that such a legislative proposal would receive in the Cedarvale neighbourhood, especially from home owners bordering the ravine. Cedarvale ravine is presently being considered for official designation.

The boundaries of the proposed ravine designation are shown in Figures 13 and 14. As one can see, the boundaries follow the topography of the ravine fairly well. However, property owners are attempting to modify the boundaries in order to render their development plans acceptable. If such appeals are successful, alteration of slopes or construction too close to the ravine edge could occur, and this may well lead to extensive erosion. For an example, note the location of the proposed housing project in Figure 12 with respect to the topographical edge of the ravine.

Even if, for the sake of argument, we assume that Cedarvale will be officially designated according to topographical boundaries, the prospects for preservation would still be uncertain. By-laws would have to be passed specifying the legal sanctions against ravine alterers. Furthermore, in order to be effective the penalties would have to be quite severe, since a fine of a couple of thousand dollars would hardly deter a wealthy ravine edge property owner with a craving for backyard tennis.

To conclude, the preservation of Cedarvale ravine, like any urban natural area, requires:

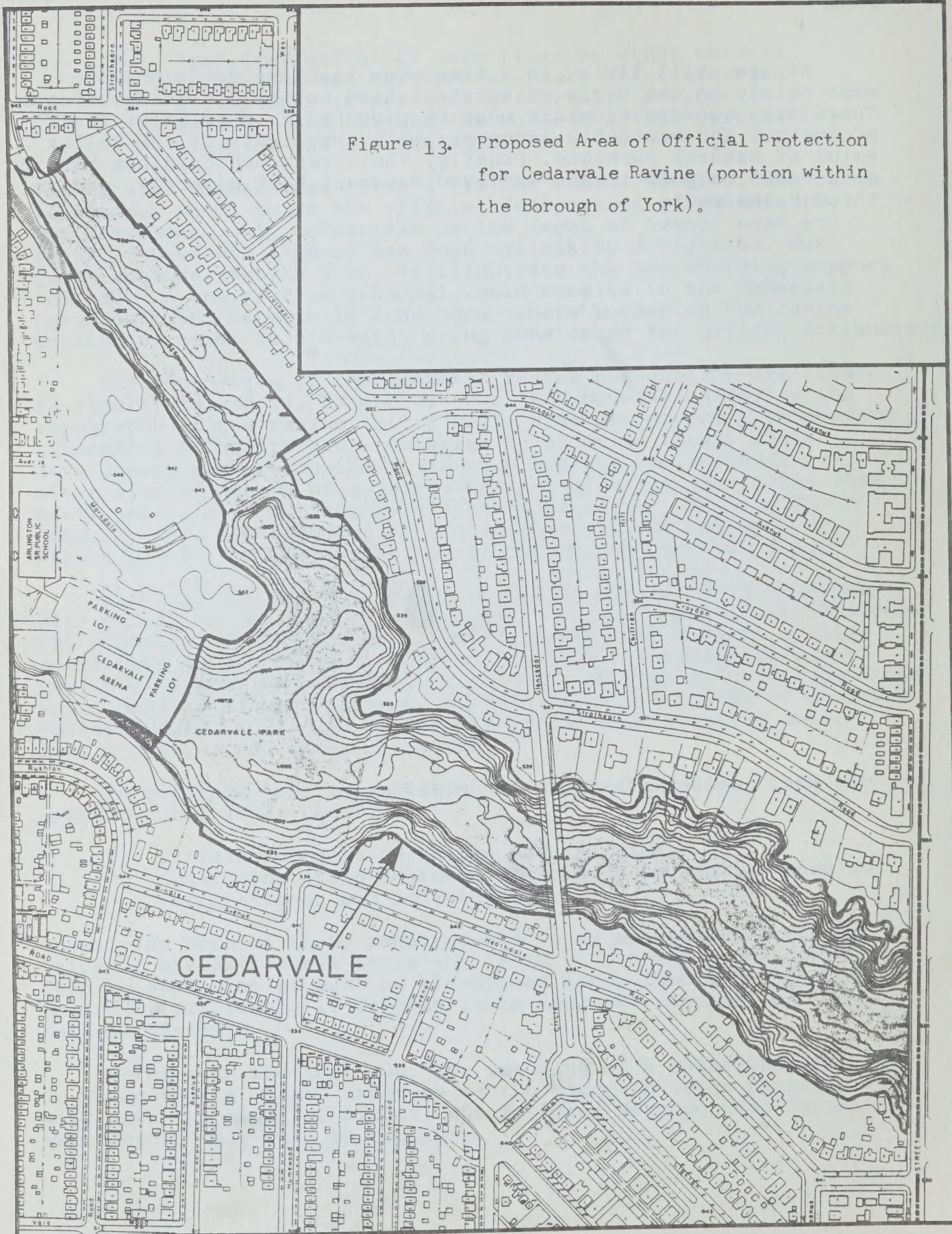
1. Official recognition of the natural area.
2. Legal protection against disturbance by public agencies, corporations, and individuals.

Underlying both of these requirements is an appreciation of the value of having natural flora and fauna within the urban context. Such an appreciation must be widespread among land use decision-makers at all levels if Toronto is to keep the remnants of its natural heritage.

Perhaps in the long run, the teaching of a conservation ethic in schools or at least exposure of the young to urban natural areas will have the greatest effect. But for many Metropolitan Toronto watersheds, this will be too late.

We are still living in a time when land use decisions are made mainly on the basis of short-sighted economic considerations. Therefore, conservationists must be prepared to supplement their ecological and aesthetic arguments with appraisals of the dollar value of natural parkland. Finally, their reasoned opinions must be made known to politicians and land managers both directly, and through the media.

Figure 13. Proposed Area of Official Protection for Cedarvale Ravine (portion within the Borough of York).



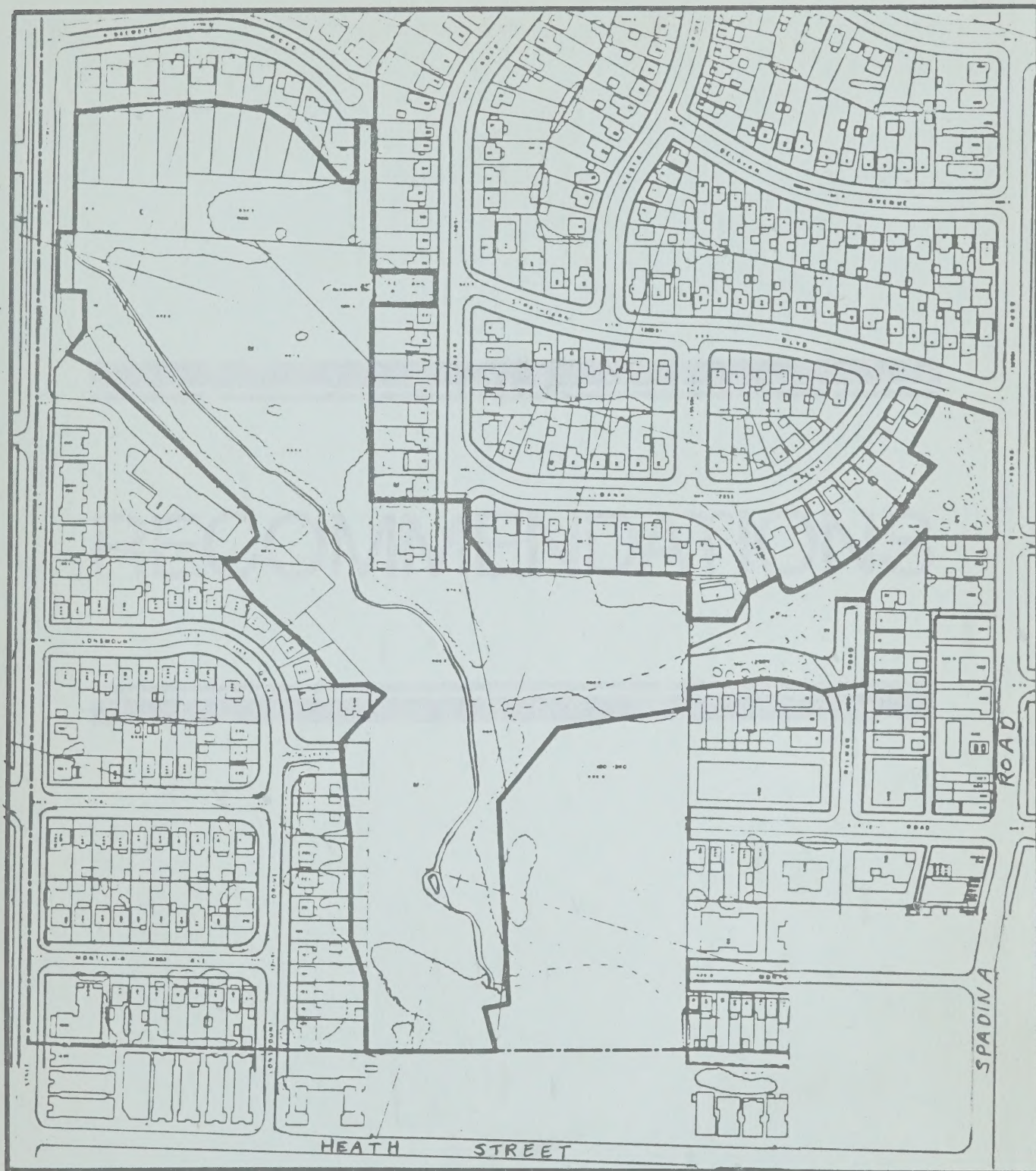


Figure 14. Proposed Area of Official Protection for Cedarvale Ravine (portion within the City of Toronto).

RECOMMENDATIONS

12. RECOMMENDATIONS

1. The unopened road allowance of Everden Road and Glenayr Road should be closed by bylaw. This will serve to end the threat of any kind of traffic route through Cedarvale ravine.

2. The Premier should put a firm end to any possibility of extending the Allen Expressway by granting 99-year leases on the bottomland of Cedarvale ravine to the Borough of York and to the City of Toronto. The 99-year lease on provincial lands in Nordheimer ravine granted by the Premier to the City of Toronto in August, 1979, could serve as a model.

3. No building should be allowed on the eight acres of field at the foot of Lonsdale Road, acquired by Cadillac-Fairview Corporation from St. Michael's College. Figure 12 in Section 11.B. shows the location and extent of the proposed development. Such a development would: Annihilate a unique successional habitat; diminish the aesthetic value of the entire south-western portion of the ravine; and radically increase the ecological stress in this area and adjacent habitats such as the Field Border and the East Conifer-Hardwood site through filling, construction, shading and overuse by humans.

4. Cedarvale ravine should be immediately and officially designated as protected lands as proposed in the official plans of the Borough of York and the City of Toronto.

5. The boundaries of the protected area designated as ravine should be determined by topography. No construction, filling, excavation or tree removal should be allowed within eight meters of the edge of a ravine slope.

6. No development should be allowed on naturally vegetated tableland adjacent to a ravine. Such areas should be included in any ravine's official designation as they serve as important ecological and aesthetic buffer zones between the ravine and the surrounding neighbourhood.

7. By-laws should be passed which impose severe penalties on any individual or corporation causing slope or vegetation disturbance in ravine lands. A stiff fine may be involved in conjunction with a court order to restore the vegetation to a reasonably natural state.

8. Any unforested natural areas such as meadow and shrubland which occur in or adjacent to Cedarvale ravine should be allowed to grow and develop untouched. This kind of habitat is extremely scarce in the urban context and supports a distinctive and diverse array of flora and fauna. Natural fields and shrublands with their

abundant wildflowers also provide a visually pleasing alternative to tall-tree forests and lawns. The meadowland was considered by our questionnaire respondents to be one of the two most attractive habitats along with the wooded slopes. This recommendation applies equally to any other urban natural area.

9. Mowing of the bottomland should be restricted to a few selected areas. Most of our questionnaire respondents preferred the bottomland to be managed as a mixture of lawn and naturally regenerating meadow.

10. Run-off from the Bathurst Street Bridge should be channelled and conducted to a storm sewer. The noxious run-off presently spills freely from the bridge onto planted vegetation and causes severe salt stress, erosion, and stream contamination. Conduction of the run-off to a storm sewer (i.e. further south on Bathurst Street) would alleviate the problem.

11. The Borough of York and the City of Toronto should connect Cedarvale and Nordheimer Ravines with a walking path from Heath Street to St. Clair Avenue. This would allow greater access to these ravines by residents of other areas. Such extended routes exist elsewhere in Metro and are well used.

12. The planted bottomland vegetation should be carefully maintained, especially during the 1980 growing season. As discussed in Section 11.A., the planted vegetation has not been maintained and many of the trees will die if not cared for. Particular care should be taken with watering as the plant-pits have a great capacity for retaining water.

13. The elevated manholes should be lowered to grade level. Assuming that the Allen Expressway is not extended, the capacity of the Spadina Trunk sewer probably needs not to be as great as it is, presently. In light of this, Metro Works should assess the practicality of lowering the manholes, as they are unsightly.

14. Insecticides should not be used. Insects are the primary source of food for nearly all of Cedarvale's birds during the breeding season. Some species such as purple martins, swallows, and flycatchers rely on aerial insects all year round. Insecticides not only limit the food supply of insectivores but are also toxic to wildlife. Perhaps purple martins could be attracted for mosquito control as is being attempted in North York.

15. Water quality in Castle Frank Brook should be tested by the Ontario Ministry of the Environment on a regular basis. Water quality has been poor in Cedarvale for several years. The main problem area is in the vicinity of Glencedar Bridge, where the water frequently has an odour of raw sewage. The source should be ascertained, and the leakage stopped. It is not only unpleasant, but is a potential health hazard as well.

16. Dead trees and limbs which are not hazardous to path users should be left standing. Almost all of the standing dead wood in Cedarvale is not in the slightest hazardous to path users. Almost all park visitors restrict their activity to the path. Standing dead wood provides song posts and nesting habitat for many bird species.

17. All projects requiring restoration of an excavated area should be required by law to recover the excavated area with sufficient topsoil to sustain vigorous growth of vegetation. In the eastern United States several states have such laws governing the restoration of strip mines. The procedure is simply to save topsoil from the initial excavation and use this material on the surface again when re-grading. Had such a program been followed in Cedarvale ravine's restoration, there is little doubt that the revegetation program would have been far more successful.

REFERENCES

- Alison, R.M. 1976. History of the Black Duck in Ontario. Ontario Field Biologist 30(1):27-34.
- Allen, R.T. 1970. The Great Lakes. Jack McLelland, Toronto.
- Anonymous. 1950. Don Valley Conservation Report. Ontario Dept. Planning and Development, Toronto.
- American Ornithologists' Union. 1957. Check-list of North American birds. Port City Press, Baltimore, U.S.A. 691 p.
- American Ornithologists' Union. 1973. Thirty-second supplement to the American Ornithologists' Union check-list of North American birds. Auk 90:411 - 419.
- Anderson, R.C., O.L. Loucks and A.M. Swain. 1969. Herbaceous response to canopy cover, light intensity, and throughfall precipitation in coniferous forests. Ecology 50:255-263.
- Beals, E.W. 1960. Forest bird communities in the Apostle Islands of Wisconsin. Wilson Bull. 72: 156-181.
- Bray, J.R. and J.T. Curtis. 1957. An ordination of the upland forest communities of southern Wisconsin. Ecol. Monographs 27:325-349.
- Brown, R.T. and J.T. Curtis. 1952. The upland conifer-hardwood forests of northern Wisconsin. Ecol. Monogr. 22:217 - 234.
- Burton, D. 1949. Bird life in Cedarvale ravine. Intermediate Nat. 4:7-8.
- Campbell, C.A. 1974. Survival of reptiles and amphibians in an urbanizing environment. In, Proc. Symp. Wildlife in an Urbanizing Environment. Co-operative Extension Service, Amherst, Mass.
- Cranmer-Byng, J., R. Cunningham and E. Hamilton, 1977. Toronto Field Naturalists' Ravine Survey Study Number Six, Burke Ravine. Toronto Field Nat. 25p.
- Crowe, J.M. 1979. Lots of weeds: an insular phytogeography of vacant urban lots. J. Biogeography 6:169 - 181.
- Curtis, J.T. 1959. The Vegetation of Wisconsin: an Ordination of Plant Communities. Univ. Wisconsin Press, Madison, Wisc. 657p.

- Curtis, J.T. and R.P. McIntosh, 1957. An upland forest continuum in the prairie-forest border region of Wisconsin. Ecology 32: 476-496.
- Douglas, G.W. and L.C. Bliss, 1977. Alpine and subalpine plant communities of North Cascades Range. Ecol. Monogr. 47.
- Eggler, W.A. 1938. The maple-basswood forest type in Washburn county, Wisconsin. Ecology 19:243-263
- Fairfield, G.M. 1970. City ravine with woods and park. Amer. Birds 24.
- Faull, J.H. ed., 1913. The Natural History of the Toronto Region. Canadian Institute, Toronto. 419p.
- French, W. 1964. A Most Unlikely Village. An Informal History of the Village of Forest Hill. Ryerson Press, Toronto. 89p.
- Gates, F.C. and G.E. Nichols. 1930. Relation between age and diameter in trees of the primeval northern hardwood forest. J. For. 28:395-398.
- Gauch, H.G. and R.H. Whittaker. 1972. Comparison of ordination techniques. Ecol. Monogr. 53:868-875.
- Gleason, H.A., and A. Cronquist. 1963. Manual of Vascular Plants of Northeastern United States and adjacent Canada. D. Van Nostrand Co., Toronto.
- Grieg-Smith, P. 1964. Quantitative Plant Ecology. Butterworth and Co. London. 256p.
- Helleiner, F. 1950. Additional notes on the birds of Cedarvale ravine. Intermediate Nat. 5:5-10
- Hett, J.M. 1971. A dynamic analysis of age in sugar maple seedlings. Ecology 52:1071-1074.
- Howard, D.V. 1974. Urban robins: A population study. In Proc. Symp. Wildlife in an Urbanizing Environment. Co-operative Extension Service, Amherst, Mass.
- Kaiser, J., A. Gotfryd, R. King, B. Wilson, A. Petrie, G. Renfrey. 1977. The Rosedale Ravines Study. Ontario Ministry of the Environment. Toronto.
- Kershaw, K.A. 1973. Quantitative and Dynamic Plant Ecology. Edward Arnold Ltd. London. 308p.

- Kolb, H. 1965. The Audubon winter bird-population study. Audubon Field Notes 37:432-434.
- Kuchler, A.W. 1967. Vegetation Mapping. N.V.Ronald Press.
- International Bird Census Committee. 1970. An international standard for a mapping method in bird census work recommended by the Int. Bird Census Comm. Audubon Field Notes 24:723-726.
- Lancaster, R.K. and W.E. Rees. 1979. Bird communities and the structure of urban habitats. Can.J.Zool. 57:2358-2368.
- Maycock, P.F. 1963. The phytosociology of the deciduous forests of extreme southern Ontario. Can.J.Bot. 41:379-437.
- Minton, S.A.jr. 1968. The fate of reptiles and amphibians in a suburban environment. J. Herpetology 2:113-116.
- Mueller-Dombois, D. and H. Ellenberg. 1974. Aims and Methods in Vegetation Ecology, J. Wiley and Sons. Toronto.
- Nie, N.H., C.H. Hull, J.G. Jenkins, K. Steinbrenner and D.H. Bent. 1975. Statistical Package for the Social Sciences. McGraw-Hill, New York. 675p.
- Pace, D. and E. Nasmith. 1977. Wooded city ravine. Amer. Birds 31:42-43.
- Pielou, E.C. 1975. Ecological Diversity. John Wiley and Sons, New York. 165p.
- 1977. Mathematical Ecology. John Wiley and Sons, New York. 385p.
- Ravine Developers, The. 1972. Foxes and Watercress: A Proposal for Cedarvale-Nordheimer Ravine. Civic Improvement Foundation, Toronto.
- Saunders, R.M. 1947. Flashing Wings. McClelland and Stewart, Toronto.
- Smith, P. 1980. Wooded city ravine. Amer. Birds 34:in press.
- Stupart, B. 1959. City ravine, winter bird population study. Audubon Field Notes 13:328-330.
- Wainio, A., G.Price, K.Jew, W. Hamiwka, L. Wilson, P. West. 1973. General Biological Survey of Three ravines within the City of Toronto. Moore Park Ravine, Vale of Avoca, Glen Stuart Ravine. Ont. Ministry of Nat. Res. 116p.

Warwick, D.P., and C.A. Lininger. 1975. The Sample Survey: Theory and Practice. McGraw-Hill, Toronto. 344p.

Weaver, J.E. and F.E. Clements. 1938. Plant Ecology. McGraw-Hill, New York. 601p.

Whitford, P.W. 1949. Distribution of woodland plants in relation to succession and clonal growth. Ecology 30:199-208.

Appendix A

PLANT SPECIES LIST

Names follow Gleason and Cronquist (1963)

Status is indicated

* -- present

** -- abundant

Note: Please fold out the map on the final page of the report while consulting this list.

PLANT
SPECIES

Equisetaceae the Horsetail Family

Equisetum arvense
Field Horsetail

* * * * *

Polypodiaceae the Polypody Family

Mattuccia
Struthiopteris
Ostrich Fern

*

Onoclea sensibilis
Sensitive Fern

*

Thelypteris palustris
Marsh Fern

*

Pinaceae the Pine Family

Picea glauca
White Spruce

*

Picea abies
Norway Spruce

*

Larix canadensis
Remlock

*

Pinus strobus
White Pine

*

*

E. Conifer-Hardwood
 Stn. Dist. Slope
 Field Border
 4th. Dist. Slope
 GP Oak Wood
 GP Oak Wood
 Maple Wood
 Shrubby Slope
 Field
 Bottomland
 Watercourse
 F.I.I. Site
 East Swamp
 West Swamp
 Plantings

HABITAT

E. Conifer-Hardwood
Sh. Dist. Slope
Field Border
Rth. Dist. Slope
SP Oak Wood
TP Oak Wood
Maple Wood
Shrubby Slope
Field
Bottomland
Watercourse
Fill Site
East Swamp
West Swamp
Plantings

PLANT
SPECIES

Pinus resinosa
Red Pine

CUPRESSACEAE the Cypress Family

Thuja occidentalis
White Cedar

TYPHACEAE the Cattail Family

Typha latifolia
Broad-leaf Cattail

Typha angustifolia
Narrow-leaf Cattail

ALISMACEAE the Water-Plantain Family

Alisma plantago-aquatica
Water Plantain

Sagittaria latifolia
Broad-leaf Arrowhead

GRAMINEAE the Grass Family

Glyceria striata
Tanna Grass

Glyceria grandis

*

*

*

*

*

*

**

**

**

*

*

*

*

*

*

HABITAT

PLANT SPECIES

E. Conifer-hardwood
Stn. Dist. Slope
Field Border
Rth. Dist. Slope
SF Oak Wood
TP Oak Wood
Maple Wood
Shrubby Slope
Field
Bottomland
Watercourse
Full Site
East Swamp
West Swamp
Plantings

Poa nemoralis

*

Poa spp.

Bluegrass

*

*

*

*

Thymus communis
weed grass

*

Hordeum spp.

Wheatgrasses, quackgrass
etc.

*

*

*

*

Lolium jubatum
Quirrel-tail Grass

*

*

Lolium boreale
English rye-grass

*

*

*

Agrostis sp.

Red Top Grass

*

*

*

Phleum pratense
Timothy Grass

*

*

Leersia oryzoides
Rice Cut-grass

**

*

Setaria viridis
Green Foxtail Grass

*

HABITAT

E. Conifer-Hardwood
 Sth. Dist. Slope
 Field Border
 Wet. Dist. Slope
 SE Oak Wood
 NE Oak Wood
 Maple Wood
 Shrubby Slope
 Field
 Bottomland
 Watercourse
 Fill Site
 East Swamp
 West Swamp
 Plantings

 PLANT
 SPECIES

CYPERACEAE the Sedge Family

Carex spp.
 Sedges

Scirpus validus
 Great Bulrush

ARACEAE the Arum Family

Arisaema triphyllum
 Jack-in-the-Pulpit

LILIACEAE the Duckweed Family

Lemna minor
 Duckweed

JUNCACEAE the Rush Family

Juncus spp.
 Rushes

Ixola sp.
 Wood Rush

LILIACEAE the Lily Family

emerocallis fulva
 Day Lily

Allium tricoccum
 Wild Leek

E. Conifer-Hardwood
W. Conifer-Hardwood
Stn. Dist. Slope
Field Border
Ath. Dist. Slope
SP Oak Wood
TP Oak Wood
Apple Wood
Shrubby Slope
Field
Bottomland
Watercourse
Fill Site
East Swamp
West Swamp
Plantings

PLANT
SPECIES

Erythronium americanum
Yellow Trout-Lily

Smilacina racemosa
False Solomon's Seal

Maianthemum canadense
Canada Mayflower

Polygonatum biflorum
Solomon's Seal

Convallaria majalis
Lily-of-the-Valley

Trillium grandiflorum
White Trillium

Smilax herbacea
Carrion Flower

Asparagus officinalis
Asparagus

IRIDACEAE the Iris Family

Iris pseudocorus
Yellow Flag

SALICACEAE the Willow Family

Populus tremuloides
Trembling Aspen

*

*

*

*

*

*

*

*

*

*

**

*

*

*

**

*

*

*

*

*

*

*

*

PLANT
SPECIES

E. Conifer-hardwood
Sth. Dist. Slope
Field border
Fh. Dist. Slope
SE Oak Wood
NE Oak Wood
Maple Wood
Shrubby Slope
Field
Bottomland
Watercourse
Fill Site
East Swamp
West Swamp
Plantings

Corylus cornuta
Beaked Hazelnut

*

Ostrya virginiana
Ironwood

*

Carpinus caroliniana
Blue-beech

*

Alnus incana
Speckled Alder

*

Betula lutea
Yellow Birch

*

*

Betula papyrifera
White Birch

*

*

*

*

*

*

FAGACEAE the Beech Family

Fagus grandifolia
Beech

*

*

*

*

Quercus borealis
Red Oak

*

*

*

*

*

*

*

Quercus alba
White Oak

*

*

*

*

ULMACEAE the Elm Family

PLANT SPECIES	E. Conifer-Hardwood	Stn. Dist. Slope	Field Border	Wth. Dist. Slope	SP Oak Wood	TP Oak Wood	Apple Wood	Shrubby Slope	Field	Bottomland	Watercourse	Fill Site	East Swamp	West Swamp	Plantings
---------------	---------------------	------------------	--------------	------------------	-------------	-------------	------------	---------------	-------	------------	-------------	-----------	------------	------------	-----------

Chenopodium album
Lamb's Quarters

CARYOPHYLLACEAE the Pink Family

Stellaria spp.
Chickweed

Cerastium spp.
Mouse-ear Chickweed

Lychnis alba
White Campion

Silene cucubalus
Bladder Campion

Saponaria officinalis
Bouncing Bet

Dianthus armeria
Deptford Pink

RANUNCULACEAE the Buttercup Family

Actaea alba
White Baneberry

Thalictrum dioicum
Early Meadow-rue

Caltha palustris
Marsh Marigold

PLANT
SPECIESRanunculus sceleratus
Celery-leaf ButtercupRanunculus acris
Common Buttercup

BERBERIDACEAE the Barberry Family

Berberis Thunbergii *
Japanese Barberry

PAPAVERACEAE the Poppy Family

Chelidonium majus *
Celandine

CRUCIFERAE the Mustard Family

Hesperis matronalis *
Dame's RocketAlliaria officinalis **
Garlic MustardLepidium virginicum
PeppergrassCapsella Bursa-pastoris
Shepherd's PurseDentaria diphylla
ToothwortE. Conifer-Hardwood
Sh. Dist. Slope
Field Border
Hb. Dist. Slope
SP Oak Wood
TP Oak Wood
Maple Wood
Shrubby Slope
Field
Bottomland
Watercourse
Fill Site
East Swamp
West Swamp
Plantings

*

*

**

*

*

*

*

*

*

*

**

**

**

**

*

*

*

*

HABITAT

E. Conifer-Hardwood
Stn. Dist. Slope
Field Border
Wth. Dist. Slope
SF Oak Wood
SF Oak Wood
Maple Wood
Shrubby Slope
Field
Bottomland
Watercourse
F.I.I. Site
East Swamp
West Swamp
Plantings

PLANT
SPECIES

Barbarea spp.
Wintercress

*

*

Nasturtium officinale
Watercress

**

SAXIFRAGACEAE the Saxifrage Family

Philadelphus coronarius
Mock-orange

*

*

Deutzia scabra
Deutzia

*

Ribes sativum
Red Currant

*

*

*

*

Hamamelis virginiana
Witch Hazel

**

*

ROSACEAE the Rose Family

Fragaria sp.
Strawberry

*

Spirea sp.

*

Sorbaria sorbifolia
False Spirea

*

Potentilla norvegica
Low Cinquefoil

*

*

*

HABITAT

PLANT SPECIES	E. Conifer-Hardwood	Sth. Dist. Slope	Field Border	Lth. Dist. Slope	SE Oak Wood	NF Oak Wood	Maple Wood	Shrubby Slope	Field	Bottomland	Watercourse	Fill Site	East Swamp	West Swamp	Plantings
<u>Prunus serotina</u> Black Cherry	**	*			*	*	*	*							
<u>Prunus virginiana</u> Choke Cherry	**	*	*	*	*	*	*	*							
<u>Prunus sp.</u> Ornamental Cherry	*							*							
<u>Pyrus malus</u> Apple		*		*					*						
<u>Sorbus Aucuparia</u> European Mountain-Ash *						*	*	*							
<u>Crataegus spp.</u> Hawthorn	**	**			*							*	*	*	*
<u>Amelanchier canadensis</u> Downy Serviceberry															*
<u>Amelanchier sp.</u> Serviceberry	*														
<u>Physocarpus opulifolius</u> Ninebark											*				
FABACEAE the Bean Family															
<u>Trifolium pratense</u> Red Clover												*	*	*	*

HABITAT

PLANT SPECIES	E. Conifer-Hardwood	W. Conifer-Hardwood	Stn. Dist. Slope	Field Border	Urb. Dist. Slope	SE Oak Wood	NE Oak Wood	Maple Wood	Shrubby Slope	Field	Bottomland	Watercourse	F111 Site	East Swamp	West Swamp	Plantings
<u>Trifolium repens</u> White Clover											*					
<u>Trifolium hybridum</u> Alsike Clover											*					
<u>Melilotus alba</u> White Sweet-Clover												*				
<u>Melilotus officinalis</u> Yellow Sweet-Clover																
<u>Medicago lupulina</u> Black Medic															*	
<u>Medicago sativa</u> Alfalfa															*	
<u>Vicia cracca</u> Purple Vetch										*					*	
<u>Robinia Pseudoacacia</u> Black Locust			*	**	**					*		*			*	
GERANIACEAE the Geranium Family																
<u>Geranium maculatum</u> Storks-bill																*
<u>Geranium Robertianum</u> Herb Robert																*
SIMARUBACEAE the Quassia Family																

E. Conifer-Hardwood
Stn. Dist. Slope
Field Border
Hb. Dist. Slope
SF Oak Wood
TP Oak Wood
Shrubby Slope
Field
Bottomland
Watercourse
Fill Site
East Swamp
West Swamp
Plantings

PLANT
SPECIES

Ailanthus altissima
Tree-of-Heaven

ANACARDIACEAE the Cashew Family

Rhus typhina
Staghorn Sumac

Rhus radicans
Poison Ivy

ACERACEAE the Maple Family

Acer plantanoides
Norway Maple

Acer saccharum
Sugar Maple

Acer spicatum
Mountain Maple

Acer rubrum
Red Maple

Acer saccharinum
Silver Maple

Acer negundo
Manitoba Maple

*

**

**

**

**

*

**

*

*

*

*

**

**

*

**

**

*

*

**

**

**

**

**

**

**

**

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

*

HABITAT

E. Conifer-Hardwood
Stn. Dist. Slope
Field Border
Wth. Dist. Slope
SE Oak Wood
Maple Wood
Shrubby Slope
Field
Bottomland
Watercourse
Fill Site
East Swamp
West Swamp
Plantings

PLANT
SPECIES

VIOLACEAE the Violet Family

Viola sp. *
Violet

LYTHRACEAE the Loosestrife Family

Lythrum salicaria
Purple Loosestrife

*

*

*

*

ONAGRACEAE the Evening Primrose Family

Circaea quadrisulcata *
Enchanter's Nightshade

*

*

Epilobium hirsutum
Hairy Willowherb

*

**

Epilobium glandulosum
Northern Willowherb

*

Oenothera biennis
Common Evening Primrose

*

*

Oenothera sp.
Evening Primrose

*

UMBELLIFERAE the Parsley Family

Dauca carota
Queen Anne's Lace

*

*

*

HABITAT

PLANT
SPECIES

OLEACEAE the Olive Family

Fraxinus americana
White AshFraxinus nigra
Black AshForsythia sp.
ForsythiaSyringa vulgaris
Lilac

ASCLEPIADACEAE the Milkweed Family

Asclepias syriaca
Common Milkweed

APOCYNACEAE the Dogbane Family

Vinca minor
PeriwinkleApocynum androsaemifolium
Spreading Dogbane

CONVOLVULACEAE the Morning-Glory Family

Convolvulus sepium
Hedge BindweedE. Conifer-Hardwood
W. Conifer-Hardwood
Sch. Dist. Slope
Field Border
Ith. Dist. Slope
SF Oak Wood
Maple Wood
Shrubby Slope
Field
Watercourse
F-111 Site
East Swamp
West Swamp
Plantings

*

*

*

**

*

*

**

*

*

*

**

*

*

*

*

*

PLANT
SPECIES

E. Conifer-Hardwood
Stn. Dist. Slope
Field Border
Hh. Dist. Slope
SF Oak Wood
JP Oak Wood
Maple Wood
Shrubby Slope
Field
Bottomland
Watercourse
Fill Site
East Swamp
West Swamp
Plantings

HYDROPHYLLACEAE the Water-leaf Family

Hydrophyllum
virginianum
Virginia Waterleaf

* * *

BORAGINACEAE the Borage Family

Echium vulgare
Viper's Bugloss

*

Myosotis sp.
Forget-me-not

*

*

**

Cynoglossum officinale
Hound's Tongue

*

VERBENACEAE the Vervain Family

Verbena urticafolia
White Vervain

*

Verbena hastata
Blue Vervain

*

*

LABIATAE the Mint Family

Ajuga reptans

*

Prunella vulgaris
Self Heal

*

Leonurus cardiaca
Motherwort

*

PLANT SPECIES	E. Conifer-Hardwood	W. Conifer-Hardwood	Sth. Dist. Slope	Field Border	Wth. Dist. Slope	SE Oak Wood	WE Oak Wood	Maple Wood	Shrubby Slope	Field	Bottomland	Watercourse	Full Site	East Swamp	West Swamp	Plantings
<u>Mentha peperita</u> Peppermint											*			*		
SOLANACEAE the Nightshade Family																
<u>Solanum dulcamara</u> <u>Bittersweet</u> Nichtshade	**	**	*	*	**				*	*	*	**	*	*	*	
SCROPHULARIACEAE the Figwort Family																
<u>Verbascum thapsus</u> Mullein											*					
<u>Linaria vulgaris</u> <u>Butter-and-Eggs</u>									*	*	*	*				*
PLANTAGINACEAE the Plantain Family																
<u>Plantago major</u> Common Plantain	*	*	*		*			*	*	*	*	*	*			
<u>Plantago lanceolata</u> English Plantain										*	*	*				
RUBIACEAE the Madder Family																
<u>Galium sp.</u> Bedstraw											*	*			*	
CAPRIFOLIACEAE the Honeysuckle Family																
<u>Viburnum Opulus</u> Highbush Cranberry			*		*		*	*	*	*				*		*

PLANT SPECIES	HABITAT
<u>Viburnum Lentago</u> Nannyberry	*
<u>Sambucus canadensis</u> Common Elder	*
<u>Sambucus pubens</u> Red-bellied Elder	*
<u>Diervilla lonicera</u> Bush Honeysuckle	*
<u>Lonicera tatarica</u> Tartarian Honeysuckle	*
<u>Lonicera dioica</u> Limber Honeysuckle	*
CUCURBITACEAE the Gourd Family	
<u>Echinocystis lobata</u> Wild Cucumber	*
CAMPANULACEAE the Bellflower Family	
<u>Campanula rapunculoides</u> Creeping Bellflower	*
COMPOSITAE the Composite Family	
<u>Helianthus divaricatus</u> Wood Sunflower	*

PLANT SPECIES	E. Conifer-Hardwood	W. Conifer-Hardwood	Sth. Dist. Slope	Field Border	Uth. Dist. Slope	SF Oak Wood	NE Oak Wood	Maple Wood	Shrubby Slope	Field	Bottomland	Watercourse	Fill Site	East Swamp	West Swamp	Plantings
<u>Bidens</u> spp. <u>Beggar's Ticks</u>											*					
<u>Ambrosia trifida</u> <u>Great Ragweed</u>											*	*				
<u>Ambrosia artemisiifolia</u> <u>Common Ragweed</u>											*	*	*			
<u>Achillea millefolium</u> <u>Yarrow</u>										*	*	*				
<u>Tanacetum vulgare</u> <u>Tansy</u>										*	*	*	*			
<u>Solidago caesia</u> <u>Blue-stem Goldenrod</u>						**	*	*								
<u>Solidago canadensis</u> <u>Canada Goldenrod</u>	*								*	*	*	*				
<u>Solidago flexicaulis</u> <u>Zig Zag Goldenrod</u>	*	*				**	*									
<u>Solidago juncea</u> <u>Early Goldenrod</u>									*	*	*	*				
<u>Solidago graminifolia</u> <u>Grass-leaf Goldenrod</u>												*	*			
<u>Solidago</u> spp. <u>Goldenrod</u>	*	*		*	*	*	*	*	*	*		*	*			*

HABITAT

E. Conifer-Hardwood
W. Conifer-Hardwood
Stn. Dist. Slope
Field Border
Hth. Dist. Slope
SP Oak Wood
Maple Wood
Shrubby Slope
Field
Bottomland
Watercourse
Fill Site
East Swamp
West Swamp
Plantings

PLANT
SPECIES

Eupatorium maculatum
Joe-Pye-Weed

Eupatorium perfoliatum
Boneset

Artium minus
Common Burdock

Cirsium vulgare
Bull Thistle

Cirsium arvense
Canada Thistle

Taraxacum officinale
Dandelion

Cichorium intybus
Chickory

Tragopogon dubius
Goat's Beard

Total species
by habitat

Total species for entire ravine = 229

54 39 22 23 22 36 56 21 36 42 80 40 29 37 40 15

Appendix B

BOTANY

Table B1 Age and Diameter Characteristics of the Tree Species in the North-facing Oak Wood.

SPECIES	AGE (yr)		DIAMETER (cm)	
	Mean $\pm$ SD	Range	Mean $\pm$ SD	Range
Red Oak	107.5 $\pm$ 11.7	45	47.8 $\pm$ 10.0	40
Sugar Maple	53.8 $\pm$ 19.7	59	23.0 $\pm$ 11.0	29
Norway Maple	31.3 $\pm$ 7.2	21	10.7 $\pm$ 1.6	4
Hemlock	78.0 $\pm$ 18.2	52	19.8 $\pm$ 6.7	18
Red Maple	41.4 $\pm$ 16.2	40	16.6 $\pm$ 4.22	11
Beech	64.0 $\pm$ 16.8	32	28.8 $\pm$ 13.2	25
Black Cherry	49.0 $\pm$ 1.4	2	15.0 $\pm$ 1.4	2
White Ash	42.0		13.0	
White Oak	108.0		31.0	
Yellow Birch	-		38.0	

Table B2. Age and Diameter Characteristics of the Tree Species in the South-facing Oak Wood.

SPECIES	AGE (yr)		DIAMETER (cm)	
	Mean $\pm$ SD	Range	Mean $\pm$ SD	Range
Red Oak	76.4 $\pm$ 11.9	52	34.3 $\pm$ 11.6	42
Sugar Maple	43.6 $\pm$ 7.4	22	17.5 $\pm$ 7.9	9
White Ash	34.8 $\pm$ 20.9	52	22.1 $\pm$ 16.1	42
White Oak	77.3 $\pm$ 8.4	15	20.3 $\pm$ 5.9	11
Ironwood	25.5 $\pm$ 4.5	3	12.0 $\pm$ 2.8	4
Beech	50.0	-	16.0	-
Red Maple	-	-	18.0	-
All Species	64.8 $\pm$ 21.7	82	28.8 $\pm$ 13.4	37

Table B3. Age and Diameter Characteristics of the Tree Species in the Maple Wood.

SPECIES	AGE (yr)		DIAMETER (cm)	
	Mean $\pm$ SD	Range	Mean $\pm$ SD	Range
Silver Maple	38.1 $\pm$ 9.8	30	31.9 $\pm$ 10.5	27
Norway Maple	33.3 $\pm$ 18.3	43	22.7 $\pm$ 16.0	40
European Mountain-Ash	37.0	-	14.0	-
All Species	36.5 $\pm$ 12.7	43	28.2 $\pm$ 13.0	40

Table B4. Age and Diameter Characteristics of the Tree Species in the East Conifer-Hardwood Site.

SPECIES	AGE (yr)		DIAMETER (cm)	
	Mean $\pm$ SD	Range	Mean $\pm$ SD	Range
Hawthorn	30.1 $\pm$ 9.7	30	16.0 $\pm$ 6.8	12
Black Cherry	38.2 $\pm$ 12.4	38	26.8 $\pm$ 12.2	35
White Pine	85.8 $\pm$ 11.9	16	53.8 $\pm$ 4.0	11
Hemlock	100.5 $\pm$ 31.8	45	39.8 $\pm$ 5.0	11
Staghorn Sumac	14.7 $\pm$ 2.5	5	10.0 $\pm$ 7.1	10
White Birch	59.0 $\pm$ 29.7	42	37.5 $\pm$ 14.8	21
Yellow Birch	48.0		36.0	
Norway Maple	30.0		20.0	
Sugar Maple	34.0		10.0	
Buckthorn	25.0		10.0	
All Species	40.4 $\pm$ 24.4	111	24.6 $\pm$ 15.6	50

Table B5, Two Comparison Measures Between the Canopy Species of Various Habitats.^{1 2}

	East Conifer- Hardwood Site	Maple Wood	North- facing Oak Wood	South- facing Oak Wood	South Disturbed Slope	West, Conifer- Hardwood Site	North Disturbed Slope	Mixed Wood	Field Border
East Conifer- Hardwood Site		15.4	50.0	11.8	14.3	54.6	12.5	36.4	11.8
Maple Wood	1.8	Coefficient of Community							
North-facing Oak Wood	14.9								
South-facing Oak Wood	1.7								
South Disturbed Slope	1.8								
West Conifer- Hardwood Site	45.2	13.3	16.6	6.8	22.4	37.5	22.2	50.0	21.1
North Disturbed Slope	3.8	0.0	1.4	3.5	27.3	12.2		11.1	61.6
Mixed Wood									10.5

¹ See text for explanation of Percent Similarity and Coefficient of Community.

² Values given are percentages.

Table B6 Comparison Measures of the Understory Communities of Cedarvale.^{1 2}

	East Conifer- Hardwood Site	Maple Wood	North- facing Oak Wood	South- facing Oak Wood	South Disturbed Slope	West Conifer- Hardwood Site	North Disturbed Slope	
East Conifer- Hardwood Site		42.3	29.2	40.0	44.9	49.2	51.9	
Maple Wood	25.2		42.1	62.2	46.2	47.1	36.4	
North-facing Oak Wood	36.4	51.9		54.9	17.1	34.0	20.0	
South-facing Oak Wood	29.6	36.2	56.5		33.3	44.4	29.8	
South Disturbed Slope					Percent Similarity			43.9
West Conifer- Hardwood Site							34.0	

¹ See text for explanation of Coefficient of Community and Percent Similarity.

² Values given are percentages.

Table B7 . Multiple Regression Analyses¹ of the Relationship of Understory Plant Density² to Canopy Cover, Choke Cherry Density³ and Slope Aspect⁴.

VARIABLE	Without Slope Aspect		With Slope Aspect	
	Partial Correlation Coefficient	Multiple Regression Coefficient	Partial Correlation Coefficient	Multiple Regression Coefficient
Constant	-	5.9701	-	2.5841
Canopy Cover	-.2388	-.0285	-.2064	-.0247
Choke Cherry Density	-.3709	-.6032	-.3794	-.6170
Slope Aspect	-	-	.4953	1.3793
Multiple Correlation Coefficient		.4353		.6585
Percent of Variance Explained		18.9		43.4

1 P < 0.01 for all coefficients.

2 Understory plant density total understory plant density - choke cherry density. The square root of this value is used in this analysis.

3 The square root of choke cherry density is used in this analysis.

4 See text for explanation of slope aspect.

Appendix C

BIRDS

Table C1.

THE BIRDS OF CEDARVALE¹

SPECIES	Historical Data ²			Recent Data ³		
	Winter	Migration	Breeding Season	Winter	Migration	Breeding Season
Common Loon		*			*	
Great Blue Heron		*				
Green Heron		*			*	
Black-crowned Night Heron		+				
American Bittern		*				
Least Bittern		*				
Whistling Swan		*				
Canada Goose		*			*	
Snow Goose		+				
Mallard		*	*			*
Black Duck	*	*			*	
Pintail		*				
Greater Scaup		+				
Common Goldeneye		+				
Common Merganser		+				
Turkey Vulture		*			+	
Goshawk		*				

¹ Status is as follows; + , one record; * , more than one record; ? , suspected breeding.

² Based on the following records: Saunders(1947); Burton(1949); Helleiner(1950); James Baillie, unpublished data; Cliff Hope, unpublished data; Donald Burton, unpublished data.

³ Based on: David Hanna, unpublished data; Hugh Currie and Herbert Elliot, unpublished data; Paul Smith, unpublished data; Toronto Field Naturalists, unpublished data; data from the present study.

Historical Data

Recent Data

SPECIES	Historical Data			Recent Data		
	Winter	Migration	Breeding Season	Winter	Migration	Breeding Season
Sharp-shinned Hawk	+	*				
Cooper's Hawk	*	*				
Red-tailed Hawk	*	*	*	*		*
Red-shouldered Hawk		*				
Broad-winged Hawk		*				
Bald Eagle						
Marsh Hawk	*	*				
Osprey		+				
Gyr Falcon		+				
Peregrine Falcon		*				
Merlin		*				
American Kestrel	*		*	*		*
Ring-necked Pheasant	*		*	*		?
Virginia Rail		*				
Sora			*			
Killdeer			*			*
Black-bellied Plover		+				
American Woodcock		*			+	
Common Snipe		*				
Upland Sandpiper		*				
Spotted Sandpiper		*	*		*	?
Solitary Sandpiper		*			*	

SPECIES	Historical Data			Recent Data		
	Winter	Migration	Breeding Season	Winter	Migration	Breeding Season
Glaucous Gull	+					
Great Black-backed Gull		+				
Herring Gull	*	*		*	*	
Ring-billed Gull	*	*		*	*	
Rock Dove	*		*	*		*
Mourning Dove			*	+		*
Yellow-billed Cuckoo		*	*		*	
Black-billed Cuckoo		*	*		+	
Screech Owl	*		*			
Great Horned Owl	*		?			
Snowy Owl	*					
Barred Owl	*					
Long-eared Owl	*					
Short-eared Owl	*					
Saw-whet Owl	*		*			
Boreal Owl	*					
Whip-poor-will		*				
Common Nighthawk			*			?
Chimney Swift			*			?
Ruby-throated Hummingbird		*			*	
Belted Kingfisher		*			*	
Common Flicker	*	*	*	*	*	*
Pileated Woodpecker		*				

SPECIES	Historical Data			Recent Data		
	Winter	Migration	Breeding Season	Winter	Migration	Breeding Season
Red-headed Woodpecker		*	*		*	
Yellow-bellied Sapsucker		*		+	*	
Hairy Woodpecker	*	*		*	*	?
Downy Woodpecker	*	*	*	*	*	*
Black-backed Three-toed Woodpecker	*					
Eastern Kingbird		*	*		*	?
Great Crested Flycatcher			*			*
Eastern Phoebe		*			*	
Yellow-bellied Flycatcher		*	*		*	
Acadian Flycatcher		*			*	
Least Flycatcher		*			*	
Eastern Wood Peewee		*	*		*	*
Olive-sided Flycatcher		*				
Horned Lark		*	*		+	
Tree Swallow		*				
Bank Swallow		*				
Rough-winged Swallow		*				
Barn Swallow		*				
Cliff Swallow		+				
Purple Martin		*	*			
Blue Jay	*	*	*	*	*	*
Common Crow	*	*	*	*	*	*

SPECIES	Historical Data			Recent Data		
	Winter	Migration	Breeding Season	Winter	Migration	Breeding Season
Tufted Titmouse		+				
Black-capped Chickadee	*		*	*		*
Boreal Chickadee	+					
White-breasted Nuthatch	*			*		
Red-breasted Nuthatch		*			*	
Brown Creeper	+	*			*	
House Wren		*	*		*	
Winter Wren	*	*			*	
Bewick's Wren		+				
Carolina Wren	+	*				
Long-billed Marsh Wren		*			+	
Short-billed Marsh Wren		*				
Gray Catbird	+	*	*		*	*
Brown Thrasher		*	*		*	*
American Robin	*	*	*	*	*	*
Wood Thrush		*	*		*	*
Hermit Thrush	+	*			*	
Swainson's Thrush		*			*	
Gray-cheeked Thrush		*				
Veery		*			*	
Eastern Bluebird		*				
Blue-gray Gnatcatcher		*			*	

Historical Data

Recent Data

SPECIES	Historical Data			Recent Data		
	Winter	Migration	Breeding Season	Winter	Migration	Breeding Season
Golden-crowned Kinglet		*			*	
Ruby-crowned Kinglet		*			*	
Water Pipit		*				
Bohemian Waxwing	+					
Cedar Waxwing	*					*
Northern Shrike	*			*		
Starling	*		*	*		*
Yellow-throated Vireo		*				
Solitary Vireo		*			*	
Red-eyed Vireo		*	*		*	*
Philadelphia Vireo		*				
Warbling Vireo		*			*	
Black and White Warbler		*			*	
Worm-eating Warbler		*				
Golden-winged Warbler		*				
Blue-winged Warbler		*				
Tennessee Warbler		*			*	
Orange-crowned		*				
Nashville Warbler		*			*	
Northern Parula Warbler		*			*	
Yellow Warbler		*	*		*	
Magnolia Warbler		*			*	
Cape May Warbler		*			*	

Historical Data

Recent Data

SPECIES	Historical Data			Recent Data		
	Winter	Migration	Breeding Season	Winter	Migration	Breeding Season
Black-throated Blue Warbler		*			*	
Yellow-rumped Warbler		*			*	
Black-throated Green Warbler		*			*	
Cerulean Warbler		*				
Blackburnian Warbler		*			*	
Chestnut-sided Warbler		*			*	
Bay-breasted Warbler		*			*	
Blackpoll Warbler		*			*	
Pine Warbler		*				
Prairie Warbler		+				
Palm Warbler		*				
Ovenbird		*			*	
Northern Waterthrush		*			*	
Louisiana Waterthrush		+				
Mourning Warbler		*				
Connecticut Warbler		+			+	
Common Yellowthroat		*			*	
Yellow-breasted Chat		+			+	
Hooded Warbler		+			+	
Wilson's Warbler		*			*	
Canada Warbler		*			*	
American Redstart		*	*		*	
House Sparrow	*		*	*		*

Historical Data

Recent Data

SPECIES	Historical Data			Recent Data		
	Winter	Migration	Breeding Season	Winter	Migration	Breeding Season
Bobolink		*	*		*	
Eastern Meadowlark		*	*		*	
Red-winged Blackbird		*	*		*	*
Orchard Oriole		*				
Northern Oriole		*	*		*	*
Rusty Blackbird		*				
Common Grackle	+	*	*	+	*	*
Brown-headed Cowbird		*	*		*	*
Scarlet Tanager		*			*	
Cardinal	*		*	*		*
Rose-breasted Grosbeak		*			*	?
Indigo Bunting		*	?		*	?
Evening Grosbeak	*					
Purple Finch	*	*			*	
Pine Grosbeak	+			+		
Common Redpoll	*					
Hoary Redpoll	+					
Pine Siskin	*			+		
American Goldfinch	*		*	*		?
Red Crossbill	+					
White-winged Crossbill	+			+		
Rufous-sided Towhee	+		*	+	*	
Savannah Sparrow		*	*		*	

Historical Data

Recent Data 197

SPECIES	Historical Data			Recent Data		
	Winter	Migration	Breeding Season	Winter	Migration	Breeding Season
Vesper Sparrow		*	*			
Dark-eyed Junco	*			*		
Tree Sparrow	*			*		
Chipping Sparrow		*	*		*	?
Field Sparrow		*	*		*	
White-crowned Sparrow	+	*			+	
White-throated Sparrow	+	*			*	
Fox Sparrow	+	*			*	
Lincoln's Sparrow		*				
Swamp Sparrow	+	*			*	
Song Sparrow	*	*	*	*	*	*
Lapland Longspur	+					
Snow Bunting	*					

Total number of species recorded in Cedarvale ravine = 188

Table C2 . Christmas Bird Count Data for Cedarvale-Nordheimer (1970-1978).

SPECIES	1970	1971	1972	1973	1974	1975	1976	1977	1978
Red-tailed Hawk								1	
Marsh Hawk				1				1	
American Kestrel					1				
Herring Gull	2	6	15	15	8	1		2	1
Ring-billed Gull	6	2	30	8	10				
Rock Dove				80	63	43	53	48	85
Mourning Dove								3	
Common Flicker		1			1		1		1
Yellow-bellied Sapsucker	1								
Hairy Woodpecker	1			1					1
Downy Woodpecker	5	4		5	5	1	2	1	1
Blue Jay	9	15	2	9	11		12	8	5
Common Crow	2	2	2	4	2		3	8	7
Black-capped Chickadee	3	12	65	36	35	8		27	
White-breasted Nuthatch	3	2	2	12	7			4	1
American Robin	6	5	29	3	7	2	82	1	4
Northern Shrike		1						2	
Sterling	40	60	38	65	80	27	48	17	45
House Sparrow	8	25	20	110	48	33	11	29	70
Common Grackle								1	
Cardinal	1	4	2	16	9	1		3	
Pine Grosbeak			1						
Pine Siskin		15							
American Goldfinch	16	10	8					3	6

Table C2. continued.

197b

SPECIES	1970	1971	1972	1973	1974	1975	1976	1977	1978
White-winged Crossbill								2	
Rufous-sided Towee	1								
Dark-eyed Junco			1	9	14			8	
Tree Sparrow	10				5				
Song Sparrow	7	9		5	8	1	7	14	
Total Number ² of Species	15	14	11	13	14	7	8	18	10
Total Number ² of Individuals	113	165	170	275	223	73	166	129	141

¹ Rock Doves were not counted on CBCs until 1973.

² Excluding Herring Gull, Ring-billed Gull and Rock Dove.

Appendix D

SOILS

Soil Type	Depth	Moisture	Temperature
Soil Type	1m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	2m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	3m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	4m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	5m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	6m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	7m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	8m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	9m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	10m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	11m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	12m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	13m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	14m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	15m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	16m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	17m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	18m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	19m	10.2 ± 0.8	15.2 ± 0.5
Soil Type	20m	10.2 ± 0.8	15.2 ± 0.5

Table D1. Moisture and Organic Content¹ of Soil Samples From Eight Sites in Cedarvale Ravine.

SAMPLE SITE	DEPTH ²	Moisture Content By Weight	Organic Content By Dry Weight
South-facing Oak Wood	High	17.4 $\pm$ 8.3	7.1 $\pm$ 3.1
South-facing Oak Wood	Low	15.2 $\pm$ 6.9	4.4 $\pm$ 2.0
North-facing Oak Wood	High	19.3 $\pm$ 6.4	11.5 $\pm$ 5.3
North-facing Oak Wood	Low	13.0 $\pm$ 8.6	4.2 $\pm$ 2.7
Maple Wood	High	15.1 $\pm$ 2.3	9.4 $\pm$ 4.8
Maple Wood	Low	13.2 $\pm$ 1.7	4.6 $\pm$ 1.3
East Conifer-Hardwood Site	High	17.6 $\pm$ 3.0	11.1 $\pm$ 6.7
East Conifer-Hardwood Site	Low	17.4 $\pm$ 17.8	4.6 $\pm$ 3.7
Field	High	10.5 $\pm$ 3.9	4.1 $\pm$ 1.5
Field	Low	8.1 $\pm$ 2.8	2.9 $\pm$ 2.9
Bottom-land	High	17.3 $\pm$ 7.5	3.8 $\pm$ 1.2
Bottom-land	Low	13.0 $\pm$ 3.7	2.4 $\pm$ 1.1
Pits of the Planted Trees	High	16.5 $\pm$ 11.1	6.1 $\pm$ 1.7
Pits of the Planted Trees	Low	18.5 $\pm$ 10.7	7.2 $\pm$ 3.6

Table D1. Continued

SAMPLE SITE	DEPTH	Moisture Content By Weight	Organic Content By Dry Weight
Marsh	High	59.5 ± 13.7	21.2 ± 12.2
Marsh	Low	51.9 ± 18.5	21.6 ± 17.6

¹ Values given are mean percentages $\pm$ one standard deviation.

² Depth indicates sample from A horizon (high) or B horizon (low).

Table D². Significance of MANOVA¹ test for soil nutrient associations with habitat, site-type² and sample depth.

Nutrients	T R E A T M E N T S			
	habitat	site-type	sample depth or level	habitat & level
Nitrogen	**	***	n.s.	n.s.
Phosphorus	**	**	*	n.s.
Potassium	n.s.	n.s.	n.s.	n.s.
Sodium	***	***	n.s.	n.s.
Chlorine	**	***	n.s.	n.s.
Acidity (pH)	***	***	n.s.	n.s.

¹ - "MANOVA" means multivariate analysis of variance

² - "site-type" refers to a group of ecologically similar habitats

n.s. - not significantly related...(p>.05)

* - significantly related.....(p<.05)

** - highly significant.....(p<.01)

*** - very highly significant....(p<.001)

Table D3. Significance of test for association of nutrients using the General Linear Model.

	Nitrogen	Phosphorus	Potassium	Sodium	Chlorine	Acidity (pH)
Nitrogen	-	**	**	n.s.	n.s.	n.s.
Phosphorus		-	n.s.	*	n.s.	n.s.
Potassium			-	n.s.	n.s.	n.s.
Sodium				-	***	n.s.
Chlorine					-	n.s.
Acidity (pH)						-

n.s. - not significant.....($p > .05$)

* - significant.....($p < .05$)

** - highly significant.....($p < .01$)

*** - very highly significant. ($p < .001$)

Table D 4. Raw data on soil nutrient concentrations in nine habitats
in Cedarvale ravine

N U T R I E N T C O N C E N T R A T I O N S							
HABITAT	SAMPLE	Nitrogen (mg/g)	Phosphorus (mg/g)	Potassium (µg/g)	Sodium (µg/g)	Chlorine (µg /g)	Acidity (pH units)
Field	1ch ¹	1.0	0.67	29	55.5	30	7.4
	1cl ²	0.6	0.63	25	95.5	40	7.7
	ldh	1.9	0.85	46	65.5	30	7.2
	ldl	1.1	0.64	31	60.5	30	7.4
East Conifer- Hardwood Site	2ch	2.3	0.62	31	56.5	30	4.9
	2cl	1.7	0.56	15	45.5	30	4.9
	2fh	2.2	0.79	48	45.5	30	5.7
	2fl	0.6	0.85	10	50.5	30	4.9
Under Bathurst Street Bridge	3bh	0.1	0.49	10	65.5	30	7.1
	3bl	1.3	0.84	25	696	90	7.2
	3ch	1.8	0.86	10	1320	1750	7.3
	3cl	1.9	0.96	9	1600	1740	7.5
	3eh	1.5	1.10	29	1870	2510	7.3
	3el	0.4	0.64	120	1430	1640	8.0
	3fh	1.4	0.79	24	506	560	7.2
	3fl	0.4	0.79	47	396	400	7.8
South- Facing Oak Wood	4ah	2.5	0.82	26	116	60	6.0
	4al	2.4	0.83	32	65.5	40	5.9
	4dh	1.4	0.78	61	75.5	30	7.1
	4dl	0.7	0.69	120	110	40	7.0
North- Facing Oak Wood	5ah	2.9	0.93	37	70.5	40	6.1
	5al	1.6	0.63	18	60.5	40	5.7
	5eh	1.8	0.82	32	50.5	30	5.0
	5el	0.6	0.79	13	60.5	40	4.2
Plant Pits	6bh	2.8	1.50	43	146	230	7.4
	6bl	2.7	1.40	14	180	100	7.3
	6eh	1.6	1.20	36	60.5	40	7.1
	6el	1.6	0.67	9	50.5	40	6.3
	6fh	1.5	1.20	25	65.5	50	7.4
	6fl	0.9	0.94	17	60.5	40	7.6

.....CONTINUED ON P. 204

1 , 2 -- 'h' and 'l' refer to soil samples collected at he surface
and at a depth of 10 cm, respectively

Table D4. continued.

N U T R I E N T C O N C E N T R A T I O N S							
HABITAT	SAMPLE	Nitrogen (mg/g)	Phosphorus (mg/g)	Potassium (µg/g)	Sodium (µg/g)	Chlorine (µg/g)	Acidity (pH units)
Disturbed Bottomland	7bh	0.9	1.00	44	400	220	7.5
	7bl	0.4	0.65	39	150	40	7.8
	7ch	1.4	1.00	40	75.5	60	7.5
	7cl	0.3	0.59	43	80.5	30	7.9
	7fh	1.6	0.87	14	85.5	30	7.3
	7fl	0.4	0.66	12	120	30	7.6
Maple Wood	8bh	3.5	1.20	51	65.5	30	6.8
	8bl	1.3	0.67	33	75.5	40	7.0
	8eh	1.5	0.56	20	45.5	20	7.1
	8el	0.8	0.44	9	60.5	40	7.3
West Swamp	9ah	14.0	1.60	225	326	440	7.3
	9al	13.0	1.20	48	146	125	7.3
	9ch	5.2	1.30	34	140	72	7.2
	9cl	2.7	1.00	34	90.5	40	7.3
	9eh	3.6	0.90	36	140	50	7.3
	9el	1.5	0.80	22	75.5	40	7.3

Appendix E

QUESTIONNAIRE

Table E1. Streets in Each Neighbourhood Sampled in the Questionnaire.

North Near	South Near	North X-Street	South X-Street	North Far	South Far
Strathearn Rd.	Heathdale Rd.	Glenayr Rd.	Heathdale Rd.	Warwick Ave.	Rushton Rd.
Glenayr Rd.	Rushton Rd.	Strathearn Rd.	Rushton Rd.	Avenal Dr.	Cherrywood Ave.
Ridgewood Rd.	Windley Ave.	Ridgewood Rd.	Lonsmount Dr.	Chiltern Hill Rd.	Pinewood Av.
Millbank Ave.	Lonsmount Dr.	Millbank Ave.	Windley Ave.	Glen Cedar Rd.	Humewood Av.
			Connaught Cl.	Dewbourne Ave.	Kenwood Av.
				Markdale Av.	Winett Av.
				Ava Rd.	Maplewood Av.
				Perveril Hill Rd.	
				Flanders Rd.	
				Gloucester Gr.	
				Croydon Rd.	

Table E 2. Statistical Tests on the Differences in Response due to Neighbourhood.^{1 2}

QUESTION	Near vs. X-Street	Near vs. Far	Far vs. X-Street
Visit ravine in last two years?	n.s.	***	***
How important to live near ravine?	**	***	***
Children who play in the ravine	n.s.	*	n.s.
How important was ravine to home choice?	*	***	***
Visit ravine before subway excavation?	n.s.	*	n.s.
Satisfied with ravine restoration?	n.s.	n.s.	n.s.
Number of visits since July 1	*	*	n.s.
Number of visits since April 1	n.s.	**	*
First most frequent ravine activity	n.s.	n.s.	*
Second most frequent ravine activity	n.s.	n.s.	n.s.
Third most frequent ravine activity	n.s.	n.s.	n.s.
Illegal to cut trees on ravine slopes?	n.s.	**	n.s.
Be illegal to thin underbrush on ravine slopes	n.s.	n.s.	n.s.
Be illegal to dump garden refuse on ravine slopes	n.s.	n.s.	n.s.
Be illegal to dump garbage on ravine slopes	n.s.	n.s.	n.s.

Table E2. Continued.

QUESTION	Near vs. X-Street	Near vs. Far	Far vs. X-Street
Be illegal to fill in ravine slopes?	n.s.	n.s.	n.s.
Light ravine at night?	n.s.	n.s.	n.s.
Mow ravine regularly?	n.s.	*	n.s.
How to use marshy areas?	n.s.	n.s.	n.s.
Cut dead trees?	n.s.	n.s.	n.s.
What to do with gardens?	n.s.	n.s.	n.s.
Are the plantings adequate?	n.s.	n.s.	n.s.
What do you provide for the birds?	n.s.	n.s.	n.s.
Do you own a dog or cat?	n.s.	*	n.s.
Number of cats?	n.s.	n.s.	n.s.
Number of Dogs?	n.s.	*	n.s.
# birds recognized on sight	**	**	n.s.
# birds recognized by song	n.s.	n.s.	n.s.
# birds seen in neighbourhood	n.s.	**	n.s.
# birds seen in ravine	**	**	n.s.

Table E2. Continued

QUESTION	Near vs. X-Street	Near vs. Far	Far vs. X-Street
Are you willing to bell your cat to warn animals?	n.s.	n.s.	n.s.
# of animal species seen in yard	**	***	***
# of animal species seen in ravine	n.s.	*	n.s.
Enhance ravine floor for wildlife?	n.s.	n.s.	n.s.
How should the above be financed?	n.s.	n.s.	n.s.
Would you attend ravine nature outings?	n.s.	n.s.	n.s.
How to use ravine floor in the future?	n.s.	n.s.	n.s.

1 For nominal data the chi squared test was used to test significance, for interval data the t-test was employed (Nie et al, 1975).

2 Significance levels are indicated as: n.s. , $P > 0.05$, * , $0.05 > P > 0.01$, ** , $0.01 > P > 0.001$, *** , $P < 0.001$.

Table E3. Analysis¹ of the Effect on Ravine Usage² of Home Location, Most Frequent Ravine Activity and Presence of Children³.

VARIABLE and CATEGORY	Deviation from ⁴ Mean Number of Visits for Whole Sample	% of Variance ⁵ Explained
Effect of Location of Home		4.8
North Bordering Ravine	6.54	
South Bordering Ravine	6.49	
North Across Street	-3.07	
South Across Street	1.13	
North Far	-3.83	
South Far	-11.51	
Effect of Most Frequent Ravine Activity		19.4 **
Walk Dog	26.61	
Accompany Child	-3.47	
Walk to Store, Subway etc.	4.49	
Stroll	-8.55	
Jog	10.49	
Ski	-13.09	
Cycle	5.38	
Play	16.72	
Group Sports	-14.49	
Sunbath	-27.29	
Sit, Relax etc.	-11.40	
Nature Observation	0.94	
Sketch, Paint	-3.59	
Photography	-27.29	
Effect of Presence of Children in Household		2.7 *
Children Present	4.08	
Children Absent	-4.60	
Multiple Correlation Coefficient	.519 ***	
Percent of Variance Explained	26.9	
Mean Number of Visits for Whole Sample	19.7	

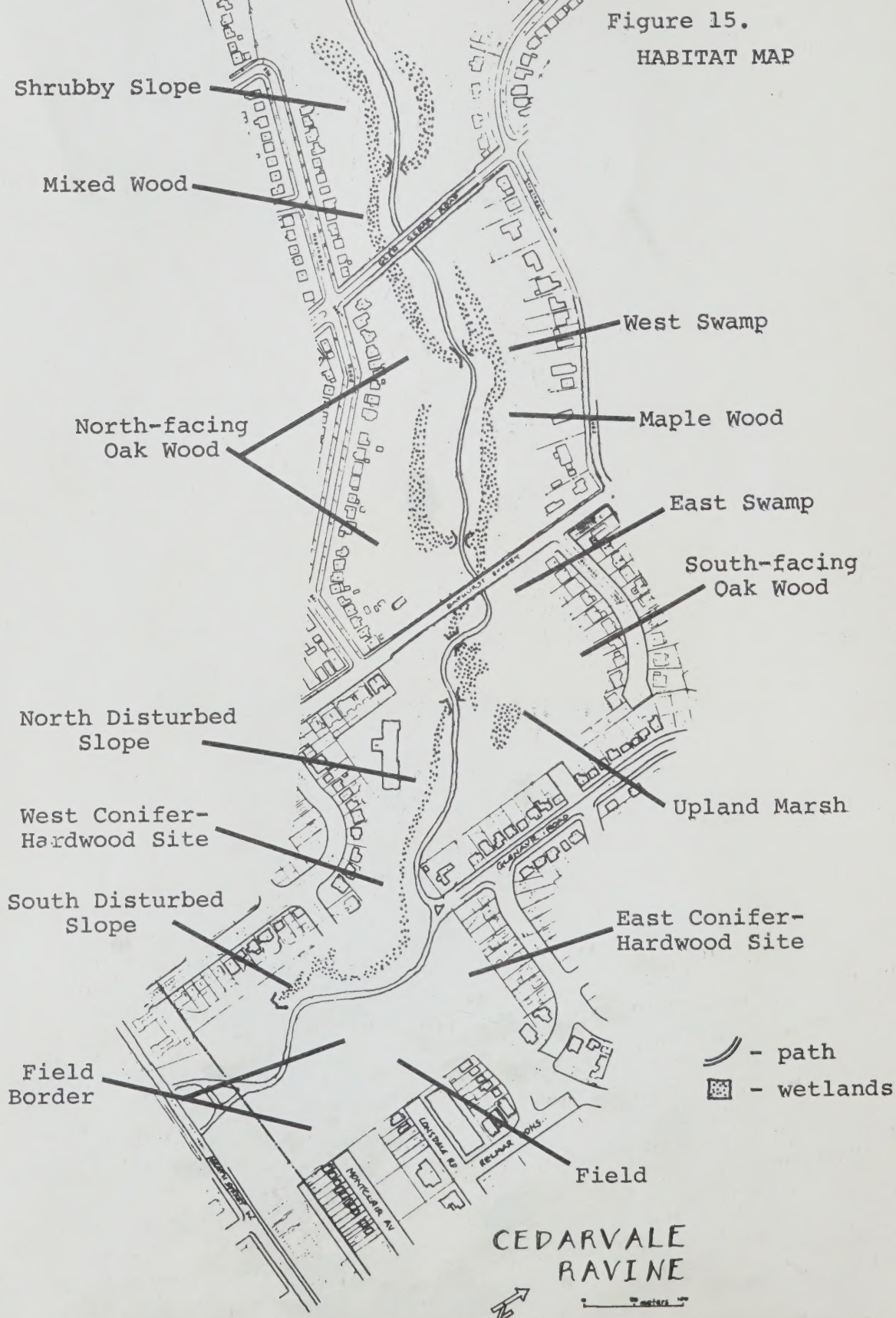
¹ Analysis is Multiple Classification Analysis (Nie et al, 1975).

² Ravine usage indicator is number of visits since 1 April, 1979 to the time of questionnaire (Question 6b).

³ Answers to Questions 3 & 7.

⁴ Example: if deviation for one question is 5 then the respondent with that answer visited the ravine 5 + other deviations + mean for whole sample (i.e. 19.7).

⁵ Significance levels are given: * , .05 > P > .01; ** , .01 > P > .001; *** , P = .001.



CA20NEV 80C26

Ontario. MOE.

CEDARVALE RAVINE. AN ECOLOGICAL AND HUMAN USE STUDY.
Gotfryd, Arnie; Smith, Paul. 1980.

3-Day loan

**RESOURCE CENTRE
INST. FOR ENVIORN'L STUDIES
UNIVERSITY OF TORONTO**

Urban Natural



Systems

